Grason-Stadler

GSI® TympStar Version 2

Middle-Ear Analyzer

Reference Instruction Manual

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Grason-Stadler - A Division of VIASYS Healthcare
5225 Verona Road, Building 2, Madison, WI 53711
TEL: 608-441-2323, 800-700-2282, FAX: 608-441-2234

VIASYS™ HEALTHCARE
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Title: GSI TympStar Version 2
Middle-Ear Analyzer
Reference Instruction Manual

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Electromagnetic compatibility (EMC)

Please refer to the Electromagnetic Compatibility Reference Guide on CD (part number 482-6387xx) for EMC information concerning your system.

Compatibilité électromagnétique (CEM)

Veuillez vous reporter au guide de référence de compatibilité électromagnétique sur CD (numéro de pièce 482-6387xx) pour des informations sur la CEM relatives à votre système.

Elektromagnetische Verträglichkeit (EMV)

Informationen über die EMV des Systems finden Sie im Referenz-Handbuch Elektromagnetische Verträglichkeit auf der CD (Teilenummer 482-6387xx).

Compatibilità elettromagnetica (EMC)

Vedere la guida alla consultazione per la compatibilita elettromagnetica contenuta sul CD (numero di parte 482-6387xx) per informazioni sulla compatibilità elettromagnetica relativa al sistema in dotazione.

Compatibilidad electromagnética (CEM)

Consulte la Guía de referencia sobre compatibilidad electromágnetica incluida en el CD (número de pieza 482-6387xx) para obtener la información sobre la CEM de su sistema.

Electromagnetic compatibility (EMC)

Please refer to the Electromagnetic Compatibility Reference Guide on CD (part number 482-6387xx) for EMC information concerning your system.

电磁兼容性 (EMC)

有关系统的 EMC 信息，请参阅 CD 上的电磁兼容性（EMC）参考指南（部件号 482-6387xx）。

電磁適合性 (EMC)

お使いのシステムに関するEMC情報については、CD(パーツ番号482-6387xx)の『電磁適合性(EMC)リファレンスガイド』を参照してください。

전자파적 합성(EMC)

시스템에 관한 EMC 정보는 CD의 『전자파적합성(EMC) 가이드』
(부품 번호: 482-6387xx)를 참조하십시오.

Compatibilidade Eletromagnética (EMC)

Favor consultar o Guia de Referência à Compatibilidade Eletromagnética no CD (número de peça 482-6387xx) para informações da EMC relativas ao seu sistema.

Preface

This manual contains the information necessary to install and operate the GSI TympStar Version 2 Middle-Ear Analyzer. ***This information is essential for the efficient use of the analyzer, and must be read and understood to avoid test errors.***

Here is what you will find in this manual:

Chapter 1: Introduction
- Introduction to the GSI TympStar Version 2 Middle-Ear Analyzer

Chapter 2: Installation
- Unpacking and inspection
- Connections
- Probe assembly
- Printer preparation
- Front panel controls
- Powering the instrument

Chapter 3: Pre-Operation activities
- Cleaning probe tubes
- Care of eartips
- Preparing test materials
- Calibration checks
- Instructing the patient
- Suggested probe-insertion technique

Chapter 4: Operation
- General format
- Test proceedures
- Tympanometry mode (Diagnostic and Screening Tymp with Reflex)
- Program mode - Tympanometry
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- Program mode - Reflex Diagnostic
- Reflex Decay - Special Test mode
- Program mode - Reflex Decay
- ETF mode (Eustachian Tube Function)
- Eustachian Tube Function testing
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- Acoustic Reflex Latency Test (ARLT) - Special Test mode
- Program mode - ARLT
- Acoustic Reflex Sensitization (A. R. SENSI) - Special Test mode
- Program mode - A. R. SENSI
- Multiple Hz
- Program mode - Multiple Hz
- Operator Altitude Cal. mode - Special Test mode
- Auto Sequence Testing
- Instrument Options - Special Test mode

Appendix A: Specifications
Appendix B: Bibliography
Appendix C: Problem solving
Appendix D: Remote Specifications

Conventions used in this manual

Icons

This manual uses the following icon conventions to draw special attention to information:

NOTES
Note icons indicate important related information, reminders, recommendations, and suggestions. Notes are shown in bold type.

CAUTIONS
Caution icons indicate information regarding a situation or condition that could result in equipment malfunction or damage, or in lost data. Cautions are shown in bold type.

WARNINGS
Warning icons indicate information regarding a situation or condition that could result in personal injury or death. You should not proceed until you thoroughly read and understand the warning information. Warnings are shown in bold type.

Operating controls

References to user controls on the instrument's front panel or LCD panel are shown as UPPER CASE in operating procedures and other instructions.

Safety Considerations

General safety precautions must be followed when operating electical equipment. Failure to observe these precautions could result in damage to the equipment and injury to the operator or patient.

The employer should instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his or her work environment to control or eliminate any hazards or other exposure to illness or injury.

It is understood that safety rules within individual organizations vary. If a conflict exists between the material contained in this manual and the rules of the organization using this instrument, the more stringent rules should take precedence.

WARNING!

WARNING

The GSI TympStar Middle-Ear Analyzer is designed to be used with a hospital grade outlet. Injury to personnel or damage to equipment can result when a three-prong or two-prong adapter is connected between the GSI TympStar power plug and an AC outlet or extension cord.

WARNING!

WARNING

The use of ACCESSORY equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:

- **Use of the ACCESSORY in the PATIENT VICINITY**
- **Evidence that the safety certification of the ACCESSORY has been performed in accordance with the appropriate IEC 601-1 and/or IEC 601-1-1 harmonized national standard.**

ANY EQUIPMENT CONNECTED TO THE GSI TYMPSTAR AND USED IN THE PATIENT VICINITY MUST BE POWERED BY AN ISOLATED POWER SOURCE TO MAINTAIN THE ELECTRICAL SAFETY OF THE OVERALL SYSTEM. The isolated power source can be purchased directly from GSI, or elsewhere when approved for use by GSI.

WARNING!

WARNING - ELECTRIC SHOCK HAZARDS
Do not open the case of the TympStar. Refer servicing to qualified personnel.

Do not remove any TympStar covers. Refer servicing to qualified personnel.

WARNING!

WARNINGS - ELECTRICAL GROUNDING
This device uses a three wire power cord with a hospital grade plug (for international applications, IEC 601-1 approved plug). The chassis is earth grounded. For grounding reliability, connect the device to a hospital grade or hospital only receptacle (for international applications, IEC 601-1 approved receptacle). Inspect the power cord often for fraying or other damage. Do not operate the apparatus with a damaged power cord or plug. Improper grounding is a safety hazard.

Do not use extension cords for the TympStar. Extension cords can cause ground integrity and impedance problems.

Periodically check the system ground integrity.

WARNING!

WARNING - EXPLOSION
This system is not explosion proof. Do not use in the presence of flammable anesthetics or other gasses.

WARNING!

WARNINGS - CONNECTIONS
Do not switch on any system power until all cables have been properly connected and verified. See this manual for setup instructions, which accompanies all deliveries of the system.

Switch off the system power before connecting or disconnecting any system component(s) or accessories. Otherwise you may damage the device(s).

WARNING!

WARNINGS - GENERAL
Proper use of this device depends on careful reading of all instructions and labels.

Follow all safety standards set by your place of employment.

Prolonged use of auditory stimuli can cause damage to patient hearing.

CAUTION!

CAUTIONS - ELECTRICAL POWER

Electrical Shock Hazard. Do not remove covers. Refer servicing to qualified personnel only.

Make sure your power cord plug is proper for the power outlet into which it will be plugged. I.e., plug in a 120V rated power cord into a 120V outlet only.

TympStar test results data is not stored when the power is turned off. To maintain test results data in the presence of power brown-outs or temporary power interruptions, an Uninterruptable Power Supply (UPS) must be used.

CAUTION!

CAUTION - CONNECTIONS

If you disconnect cables, please be careful to reconnect them in their proper locations.

CAUTION!

CAUTIONS - PREVENTIVE MAINTENANCE

Preventative maintenance does not require access to the interior of the instrument and may be performed by the user. For this device, preventative maintenance consists of periodically cleaning and inspecting the exterior of the instrument. Periodic electrical safety testing is recommended. It is recommended a schedule be established for these purposes, with at least an annual cleaning, calibration and safety testing.

Cleaning consists of removing all dust from the exterior surface of the system with a soft brush or cloth. Use a brush to dislodge any dirt on or around the connectors and panel edges. Remove any dirt with a soft cloth.

CAUTION!

CAUTIONS - GENERAL

If the system is not functioning properly, do not operate it until all necessary repairs are made and the unit is tested and calibrated for proper functioning in accordance with Grason-Stadler published specifications. It is recommended that all repairs be performed by a qualified service representative only.

Prolonged use of auditory stimuli can cause damage to patient hearing.

Product Warranty

We warrant that this product is free from defects in material and workmanship and, when properly used, will perform in accordance with applicable specifications. If within one year after original shipment it is found not to meet this standard, it will be repaired, or at our option, replaced at no charge when returned to a Grason-Stadler service facility. Changes in the product not approved by Grason-Stadler shall void this warranty. Grason-Stadler shall not be liable for any indirect, special or consequential damages, even if notice has been given of the possibility of such damages.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

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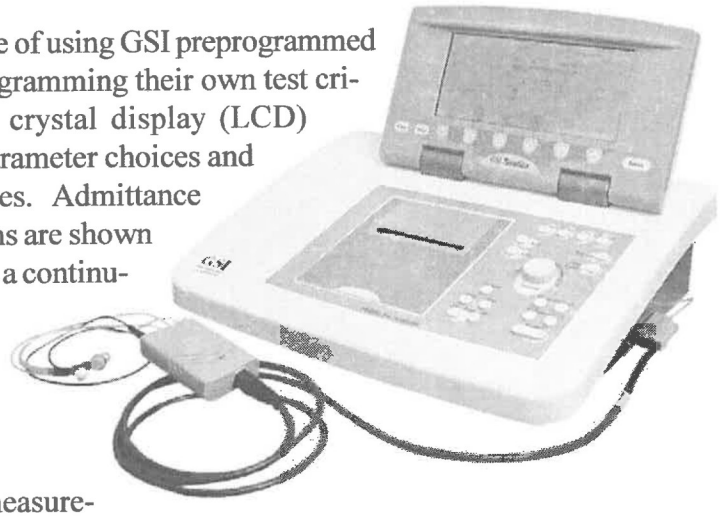
Introduction 1

General

The GSI TympStar Version 2 Middle-Ear Analyzer is a technically advanced, computer-based admittance instrument designed to be used in a clinical or research setting. The TympStar builds on the sophistication, functionality and flexibility of the GSI 33, offering unparalleled testing capabilities. It contains total capabilities for complete, manual or automatic diagnostic testing for analysis of middle ear function. Admittance (Y), and its components Susceptance (B) and Conductance (G), may be measured with probe tone frequencies of 226, 678, and 1000 Hz. The extensive battery of test mode choices include:

- Diagnostic Tympanometry
- Acoustic Reflex Threshold and Decay Measurements
- Eustachian-Tube Function Testing (Both intact and perforated eardrums)
- Screening Tympanometry/Reflex (Automatic Only)
- Acoustic Reflex Latency Testing
- Acoustic Reflex Sensitization
- Multiple Frequency Tympanometry (250 Hz to 2000 Hz)

Operators have a choice of using GSI preprogrammed test parameters, or programming their own test criteria. A large liquid crystal display (LCD) clearly displays test parameter choices and the possible alternatives. Admittance and pressure indications are shown on the LCD along with a continuous digital readout. Test status and invalid choices are also shown on the LCD.

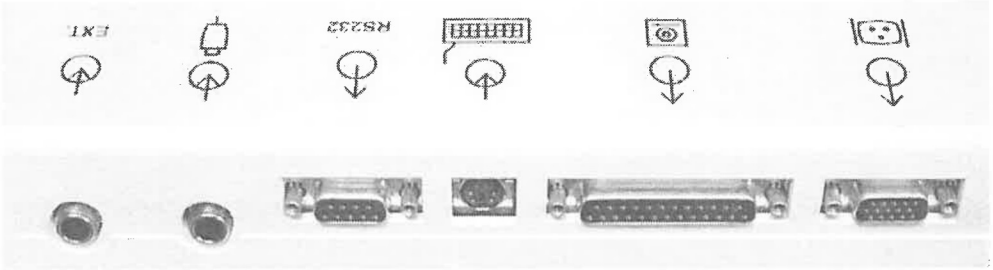


The tympanometric measurement results are automatically scaled and presented in equivalent ml of compliance at "Y", 226 Hz. All "B" and "G" measurements and measurements performed at probe tone frequencies of 678 Hz and 1000 Hz are expressed in mmhos. Sensitivity scales for the display of reflex measurement results can be selected manually. Reflex test stimuli can be input from an external source and presented via external control. A cursor is available in all test modes for calling out numeric positions on the X and Y axes.

Test results are displayed in real time. The user can view the results as they are being measured and then has the choice of printing the display or retesting the patient. The high-speed printer generates reports in concise graphical formats that are easy to read.

Equipment connections and options

TympStar options that can be connected to the rear panel include an external



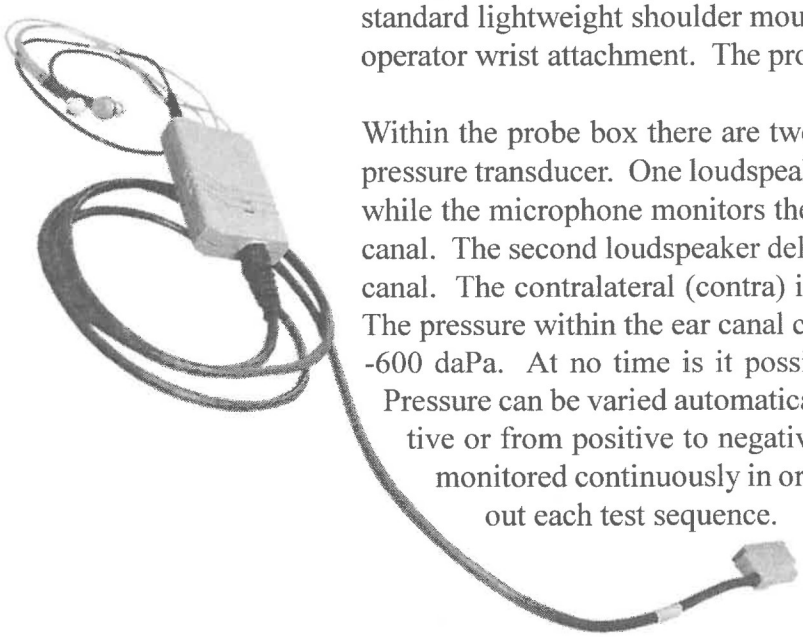
stimulus source, an external Present control, RS232 serial communication, a keyboard for entering patient information, an HP DeskJet® or LaserJet® printer and a VGA monitor for displaying test results. Other options offered for the TympStar for managing and archiving data, include:

- Internal memory for storing up to 26 test results
- Data export to an external PC via RS232 serial interface
- Remote control of the TympStar via RS232 commands from an external PC.

The probe

The innovative lightweight probe is designed for patient comfort, ease-of-seal, and accurate test results. A wide variety of both standard and special sized eartips are supplied with the GSI TympStar to hermetically seal the ear canal. In addition, a set of screening eartips is provided for screening tymp and reflex tests.

The operator has a choice of three mountings to support the probe box; the standard lightweight shoulder mounting, standard clothes clip, or an optional operator wrist attachment. The probe box has 2 LED's to indicate test status.



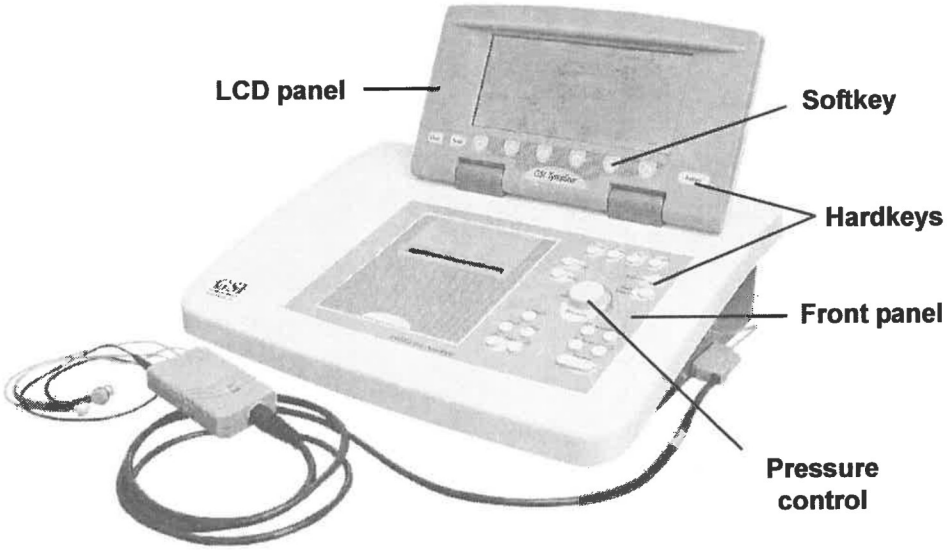
Within the probe box there are two small loudspeakers, a microphone and a pressure transducer. One loudspeaker delivers the probe tone to the ear canal, while the microphone monitors the intensity of the probe tone within the ear canal. The second loudspeaker delivers the ipsilateral (ipsi) stimuli to the ear canal. The contralateral (contra) insert phone contains its own loudspeaker. The pressure within the ear canal can be varied up to a range of +400 daPa to -600 daPa. At no time is it possible to exceed specified maximum limits. Pressure can be varied automatically or manually and from negative to positive or from positive to negative values. Pressure within the ear canal is monitored continuously in order to maintain pressure accuracy throughout each test sequence.

Instrument controls

A combination of hardkeys and softkeys are used to select the test modes and parameters and to conduct tests.

Hardkeys and softkeys

Hardkeys are located on the front panel and the sides of the LCD panel and provide fixed functions that do not change. Softkeys are located directly under the LCD and change to support the requirements of a test session.

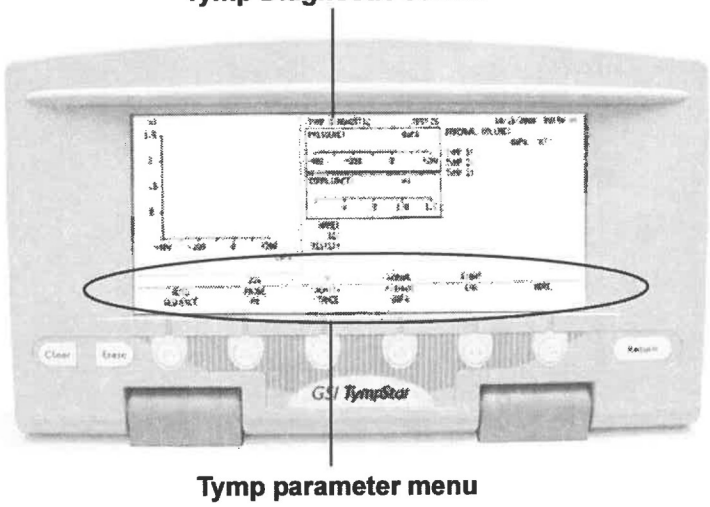


Rotary pressure control

A rotary pressure control is also provided to change or fine-tune pressure within the ear canal.

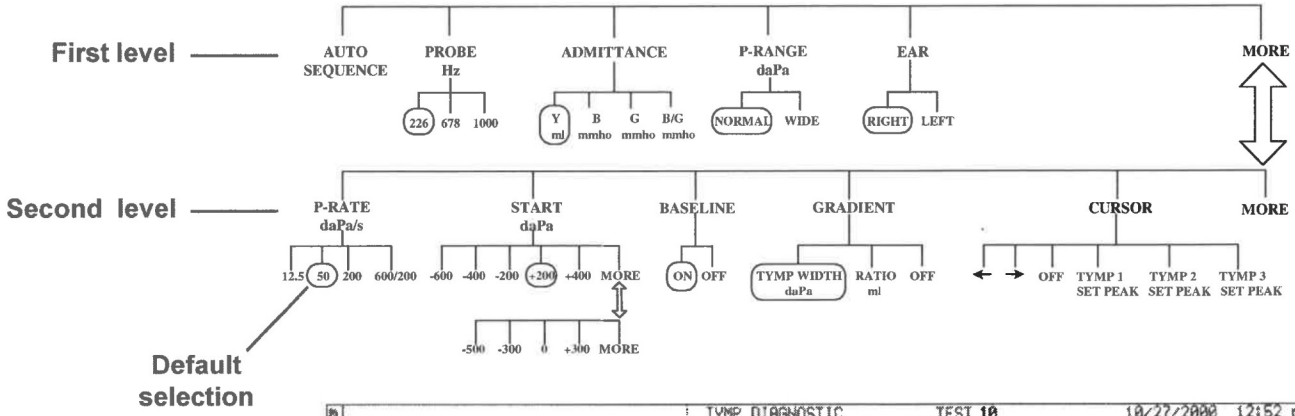
Test modes and menu navigation

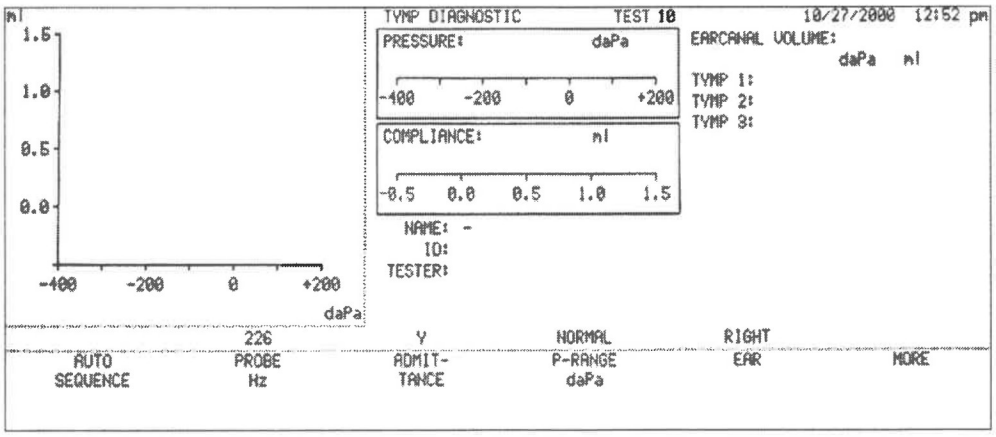
Selecting a test mode by pressing a hardkey causes the required test screen to be displayed on the LCD with the appropriate menu of test parameters shown across the bottom. The softkeys are then used in conjunction with a few hardkeys to navigate through the menus and set parameter values for the selected tests. For example, pressing the TYMP hardkey causes the Tymp Diagnostic screen to be displayed.

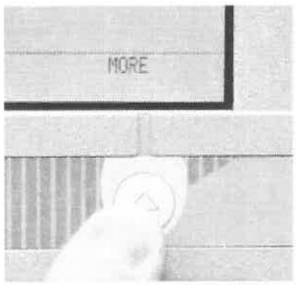


Pressing the softkeys displayed across the bottom of the LCD allows the user to navigate through the Tymp Diagnostic parameter menus diagrammed below. GSI default softkey selections are circled on menu diagrams.

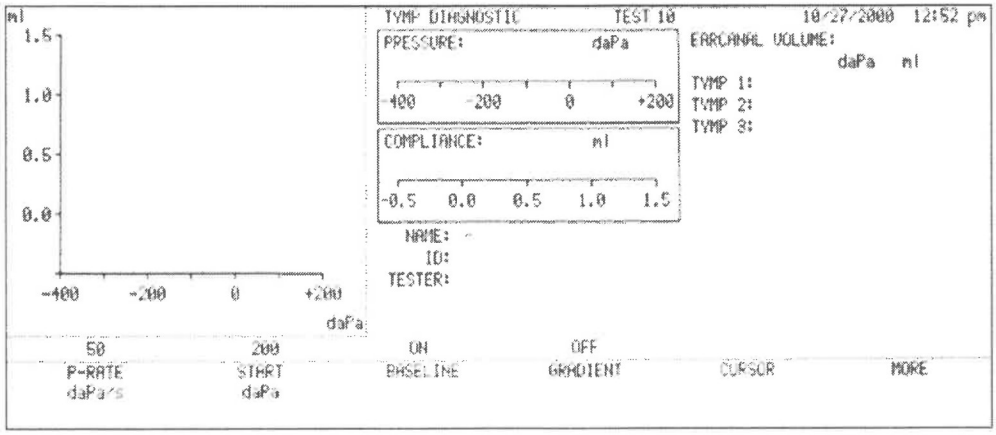
The first level of parameter menu selections includes AUTO SEQUENCE, PROBE Hz, ADMITTANCE, P-RANGE, EAR and MORE.



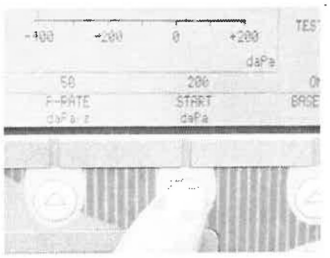




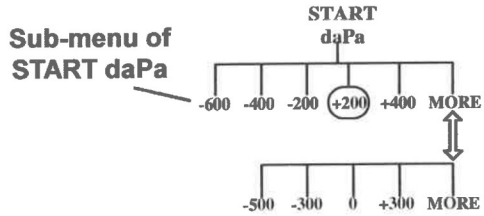
A second level of menus can be displayed by pressing the MORE softkey and includes P-RATE, START, BASELINE, GRADIENT, CURSOR and MORE.

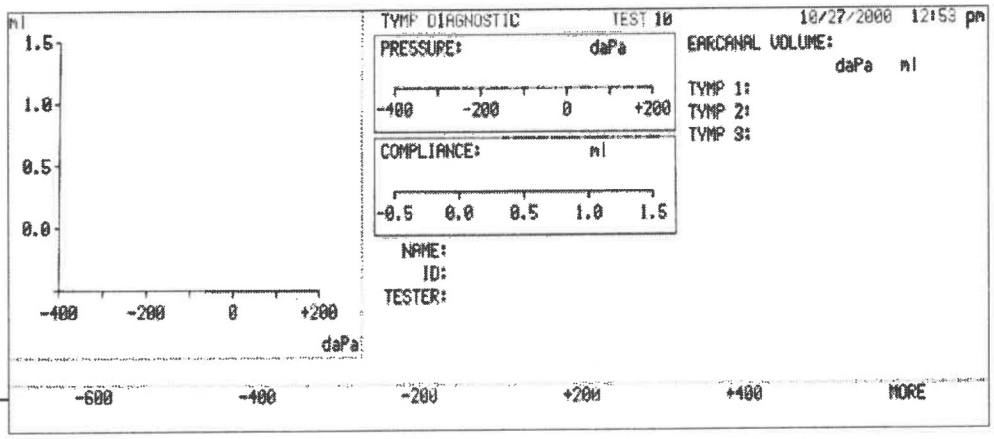


The MORE softkey is used to toggle between the top and lower levels of menus while the test screen portion above the softkeys remains unchanged.



Pressing a parameter menu softkey causes a sub-menu of parameter settings to be displayed. Often sub-menus will also contain MORE softkey selections that provide access to additional setting alternatives.

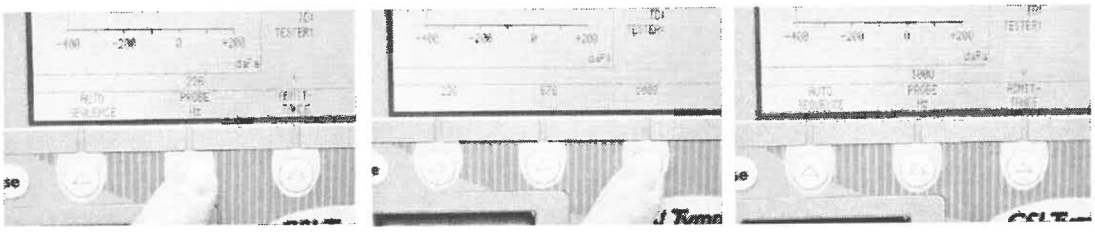




Sub-menu of START daPa

Changing parameter settings

Settings can be changed for a selected parameter by pressing the desired softkey as shown in this example of changing the Probe Hz from 226 to 1000.



Making the new selection returns the display to the previous menu level with the new setting shown above the selected parameter.

If no change is desired, the display can be returned to the previous level by pressing the RETURN hardkey.

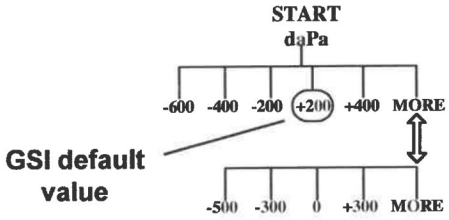
In the manner described above, menus can be navigated and settings can be changed for any of the test modes.

Menu diagrams

Menu structure diagrams like the diagrams shown on these pages will be used throughout the remainder of this manual as a convenience to the user.

GSI default parameter settings

GSI default parameters are circled on menu structure diagrams shown throughout the remainder of this manual.



Installation 2

This chapter contains the following information:

- Unpacking and inspecting the GSI TympStar and accessories page 2-1
- Equipment connections page 2-4
- Preparing the probe assembly page 2-6
- Powering the instrument page 2-7
- Preparing the internal printer page 2-8
- Preparing an external printer page 2-9
- Adjusting display contrast page 2-12
- Front panel controls page 2-13

Unpacking and inspecting the GSI TympStar

Your GSI TympStar was carefully tested, inspected, and packed for shipping. It is a good practice after receiving the instrument to examine the outside of the container for any signs of damage. Notify your carrier if any damage is noted.

Carefully remove your GSI TympStar and TympStar accessories from the shipping container. If the instrument or accessories appears to have suffered damage, notify the carrier immediately so that a proper claim can be made. Be certain to save all packing material so that the claim adjuster can inspect it as well. As soon as the carrier has completed the inspection, notify your GSI Representative.

If the instrument or an accessory must be returned to the factory, repack it carefully (in the original container if possible) and return it prepaid to the factory for the necessary adjustments.

Check all the accessories against the itemized lists in Tables 2-1 and 2-2. If any accessories are missing, notify your GSI Representative immediately.

Table 2-1
TympStar Accessories Supplied

Contra insert phone	GSI Part # 8000-0078
Calibration cavity (V2)	GSI Part # 2000-1035
Probe cleaning kit (2 boxes)	GSI Part # 2000-9610
Eartips:	
1 pkg. 8 standard sizes, 4 ea. (Color coded)	GSI Part # 1700-9660
1 pkg. 6 special sizes, 2 ea.	GSI Part # 1700-9670
1 pkg. 6 screening sizes, 2 ea.	GSI Part # 1700-9622
Reference Instruction Manual	GSI Part # 2000-0100
Quick User Guide	GSI Part # 2000-0108
Printer paper (2 rolls) for orders including printer	GSI Part # 1700-9619
Spare set of probe tubing	GSI Part # 2000-9617
Probe mount - shoulder	GSI Part # 1700-9646
Probe mount - wrist	GSI Part # 1700-9642
Probe mount - clothes	GSI Part # 1700-9608

NOTE

NOTE
Additional quantities of any accessory can be ordered from your GSI Representative or directly from Grason-Stadler. See the Specifications for optional accessories available and their respective catalog numbers.

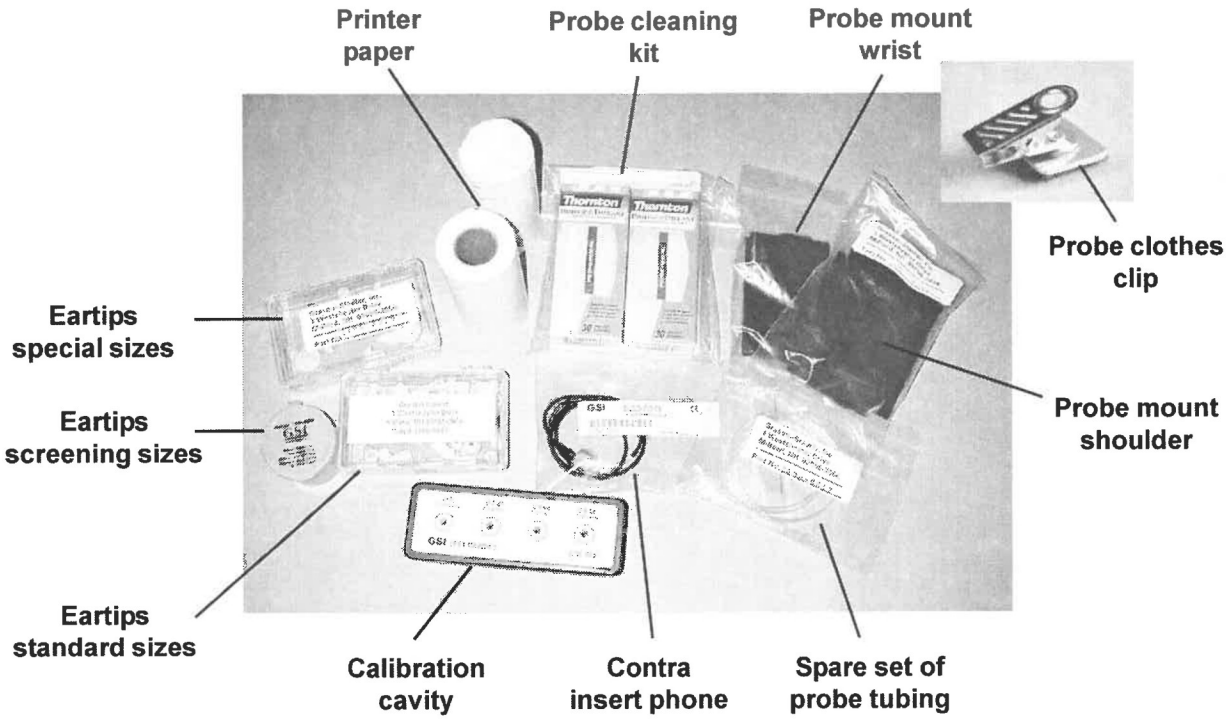
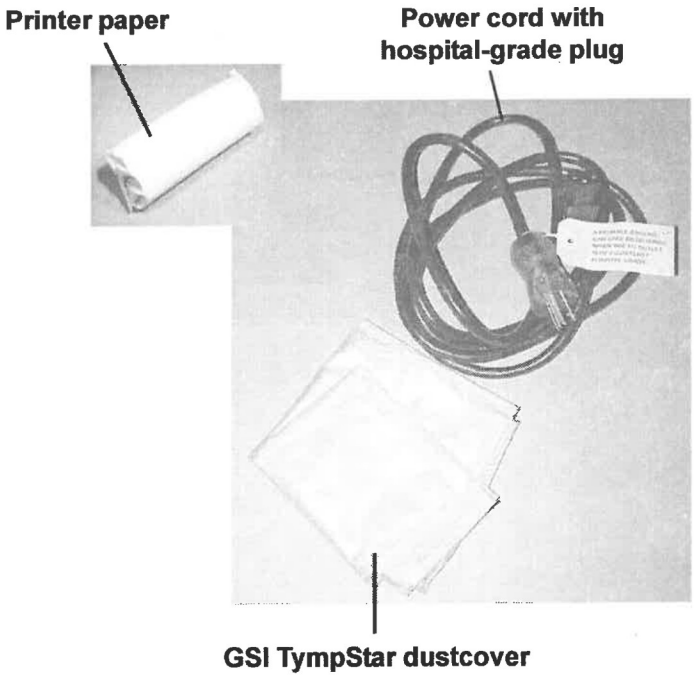


Table 2-1 (Continued)
TympStar Accessories Supplied

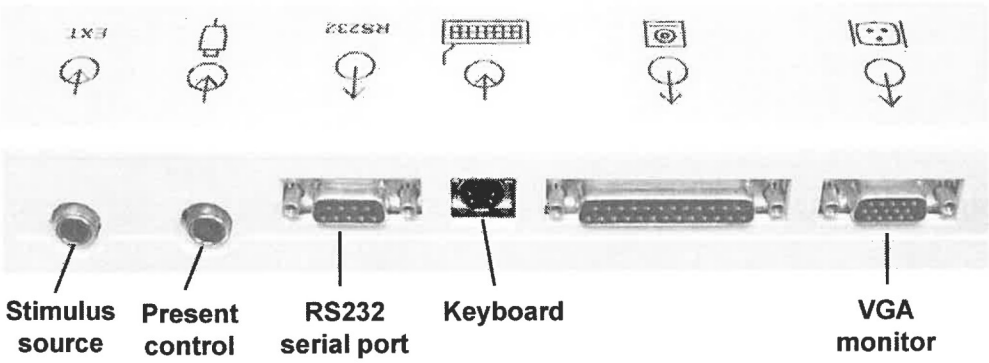
Printer paper, adhesive-backed for orders including a printer	GSI Part # 1770-9643
GSI TympStar dustcover	GSI Part # 1700-9618
Power cord with hospital-grade plug	GSI Part # 4204-0251 (USA)
Power cord part # varies depending on location	



Equipment connections

Rear panel

TympStar options that can be connected to the rear panel include RS232 serial communication, a keyboard for entering patient information, an HP DeskJet® or LaserJet® printer and a VGA monitor for displaying test results.



NOTE
Please refer to Appendix A: Specifications for the technical requirements of each of the connections shown above.

CAUTION
Improper connections to the GSI TympStar can damage the instrument and void the warranty.

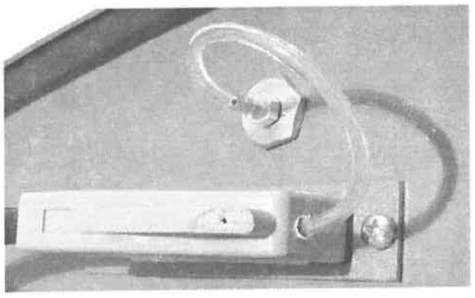
WARNING
Connecting unapproved sources of energy to the GSI TympStar can create a serious electrical shock hazard. Refer to Appendix A: Specifications for the technical requirements of each of the connections shown above.

WARNING
ANY EQUIPMENT CONNECTED TO THE GSI TYMPSTAR AND USED IN THE PATIENT VICINITY MUST BE POWERED BY AN ISOLATED POWER SOURCE TO MAINTAIN THE ELECTRICAL SAFETY OF THE OVERALL SYSTEM. The isolated power source can be purchased directly from GSI, or elsewhere when approved for use by GSI.

NOTE
A 226 Hz Y tympanogram is displayed on the LCD screen in a 1:1 aspect ratio and on the external VGA monitor in a 1.4:1 aspect ratio. The Pressure (horizontal) axis appears to be "stretched out" by 40% on the VGA monitor.

Probe

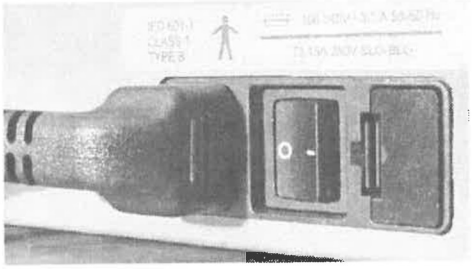
Acoustic, electric and pneumatic connections to the probe are provided by the connector on the right side of the GSI TympStar enclosure.



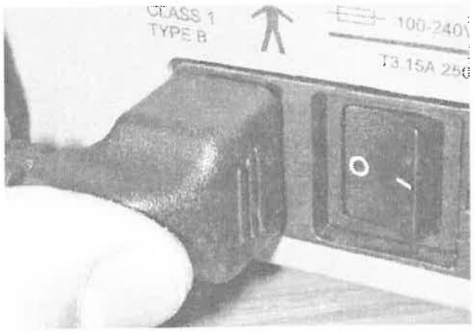
The connectors allow for removal of probe pod assembly.

Power

The power entry module contains the power plug outlet, power ON/OFF switch and instrument fuses.



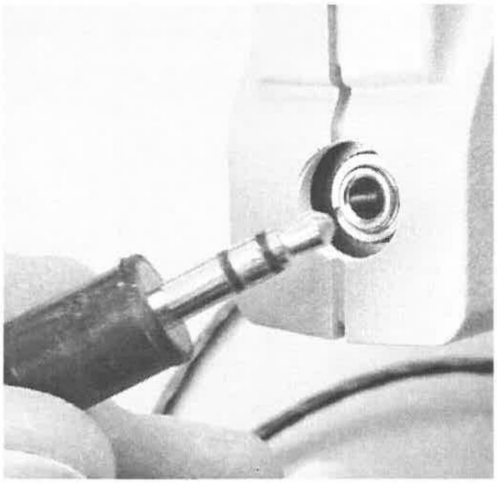
Prior to applying power to the instrument, make sure that the power cord is plugged firmly into the power entry module by pressing the cord connector into its receptacle.



Preparing the probe assembly

The ipsi probe tip and tubing are attached to the probe box at the factory.

Connect the contra insert phone cable to the jack on the top of the probe pod if contra reflex testing is to be performed. If contra testing will not be performed on a regular basis, it is not necessary to keep the contra phone attached to the probe box at all times.



CAUTION!

CAUTION

Be sure that the plug is inserted all the way into the jack to ensure proper operation.

CAUTION!

CAUTION

To ensure the accuracy of calibration, the tygon tubing supplied with the ipsi probe assembly should not be cut or altered in any way. The system has been specifically calibrated to meet specifications with the tubing length supplied with your unit. A spare set of tubing is provided. If the replacement tubing supplied with your instrument is used, recalibration is unnecessary.

Powering the instrument

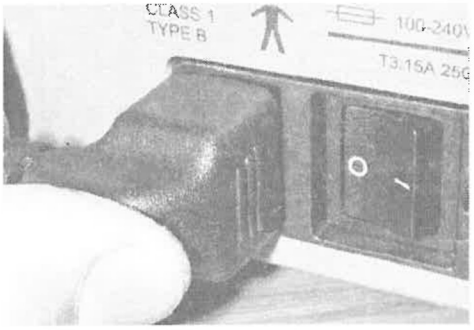
Prior to applying power

Place the GSI TympStar on a desk or countertop.

CAUTION!

CAUTION
Do not place instrument on power or probe cord.

The location should be near a hospital-grade grounded electrical outlet. Confirm that the power cord is plugged firmly into the power entry module on the left side of the GSI TympStar and insert the power plug into the hospital-grade electrical outlet.



WARNING!

WARNING
Injury to personnel or damage to equipment can result when a three-prong to two-prong adapter is connected between the GSI TympStar power plug and the source of electrical power.

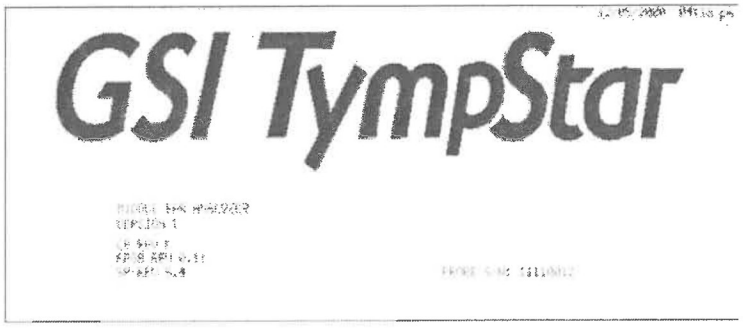
Applying power

Operate the POWER SWITCH on the left side of the instrument to the ON position (marked as "1").

NOTE

NOTE
The LCD will not display any information during the first approximately 5 seconds while the instrument's computer performs a number of internal tests to verify the condition of internal hardware.

Upon the conclusion of internal system tests, an Initialization screen will be displayed showing the time and date, TympStar model version and software version number. This screen will be displayed for approximately 20 seconds while the system software prepares for testing.



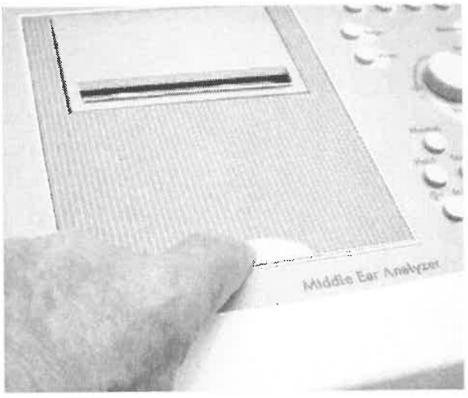
Preparing the internal printer

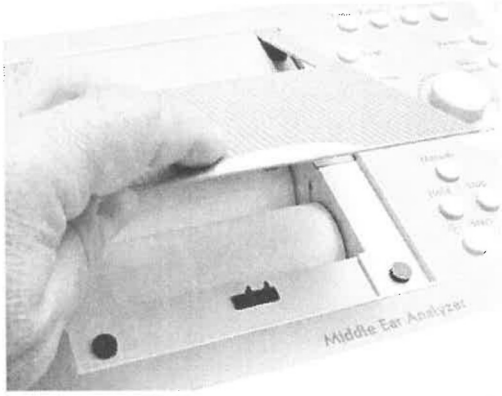
The thermal printer is located in the center of the front panel. Confirm that an adequate paper supply is installed in the GSI TympStar prior to beginning a test session.

NOTE
The edges of the thermal paper will turn red as the paper supply runs out.

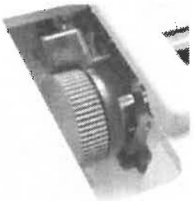
Paper supply

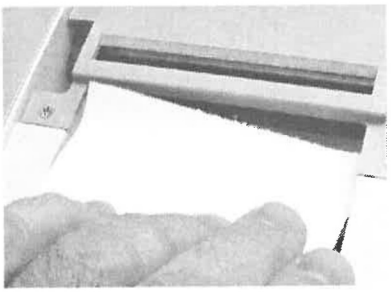
Raise the printer cover by pressing the bottom edge of the cover and lifting it. The roll of thermal paper rests in the paper tray directly in front of the printer.



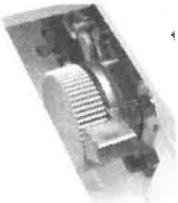


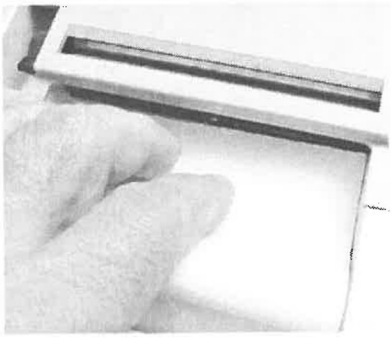
If it is necessary to replace a nearly exhausted roll of paper, rotate the release lever on the left side of the printer to its "back" position and gently pull the remaining paper out of the printer.

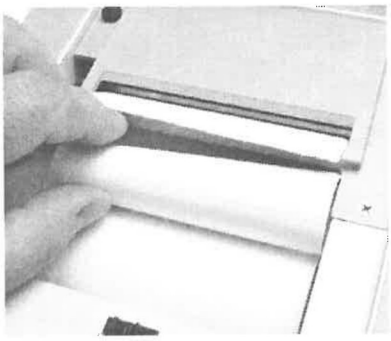




Orient the new paper roll as shown on the inside of the paper tray, rotate the release lever back to the "forward" position and feed the paper into the printer paper entrance until the printer motor and roller pulls the paper into the printer.

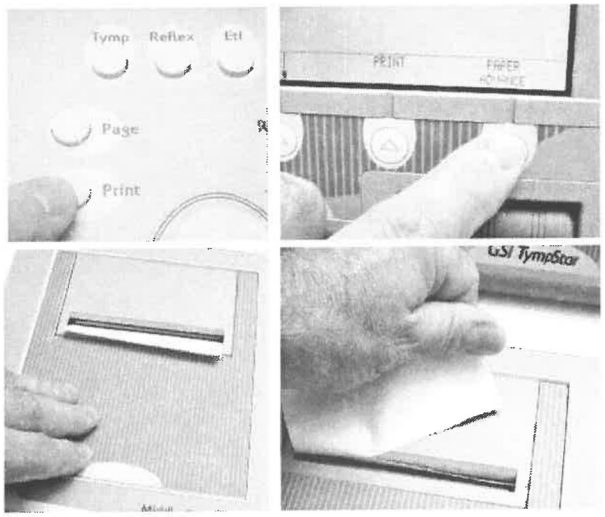






NOTE
Thermal paper can be printed on only one side. If printing is unsuccessful after changing paper rolls, check the paper orientation.

Advance the paper if necessary by pressing the PRINT hardkey and then the PAPER ADVANCE softkey. Feed the paper through the opening in the cover, close the cover and tear off any excess paper.



Return to the previous menu by pressing the RETURN softkey.

NOTE
Thermal paper supplies should be stored in a cool dry place to extend the life of the paper.

Preparing an external printer

The GSI TympStar is compatible with most Hewlett Packard DeskJet® and LaserJet® printers with PCL3. Contact GSI Service for specific models. These printers provide full sheet printouts of test data. A test printout of results containing:

- One left and right tympanogram
- A reflex threshold table for both left and right (Ipsi <u>or</u> Contra only)
- A reflex decay table for both left and right (Ipsi <u>or</u> Contra only)
  will print on one 8.5 x 11 inch (or A4) sheet of paper.

1) Turn the TympStar and printer off, then attach the printer data cable to the printer connector on the rear of the TympStar. Connect the printer power cable to AC power.

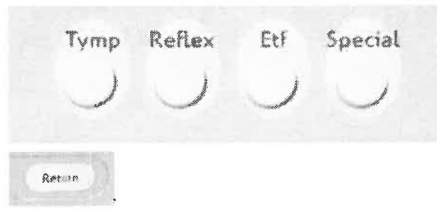
WARNING
ANY EQUIPMENT CONNECTED TO THE GSI TYMPSTAR AND USED IN THE PATIENT VICINITY MUST BE POWERED BY AN ISOLATED POWER SOURCE TO MAINTAIN THE ELECTRICAL SAFETY OF THE OVERALL SYSTEM. The isolated power source can be purchased directly from GSI, or elsewhere when approved for use by GSI.

2) Turn the TympStar and printer on. Anytime the external printer is connected and turned on, the TympStar will automatically direct printing to the external printer. To redirect printing to the internal printer, turn the external printer off or disconnect it.

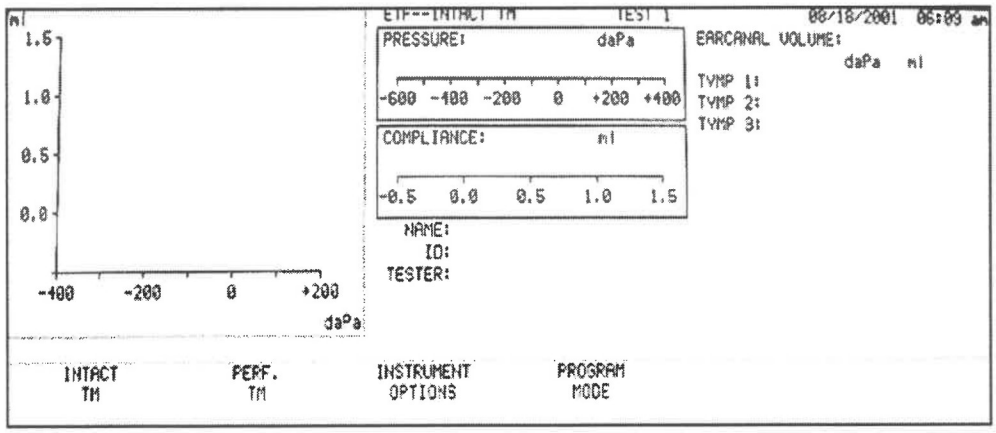
Setting external printer parameters

To set the external printer parameters:

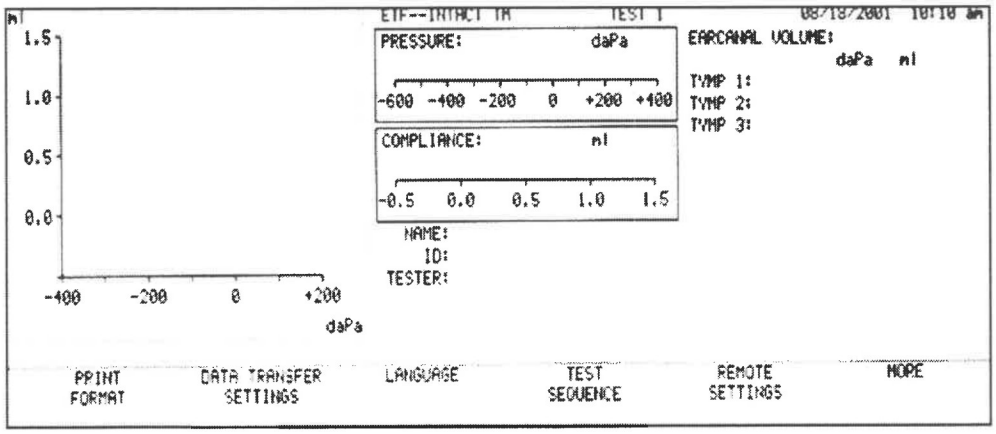
1) Press the ETF hardkey to select the ETF test mode, then press the RETURN hardkey to display the ETF submenu.



INTACT TM | **PERF TM** | **INSTRUMENT OPTIONS** | **PROGRAM MODE**

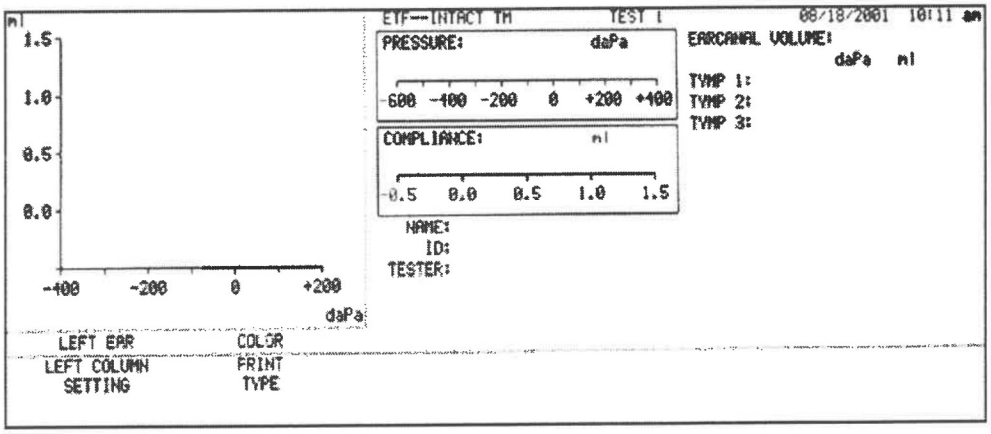


2) Press the INSTRUMENT OPTIONS softkey, then the MORE softkey to display the PRINT FORMAT softkey selection.



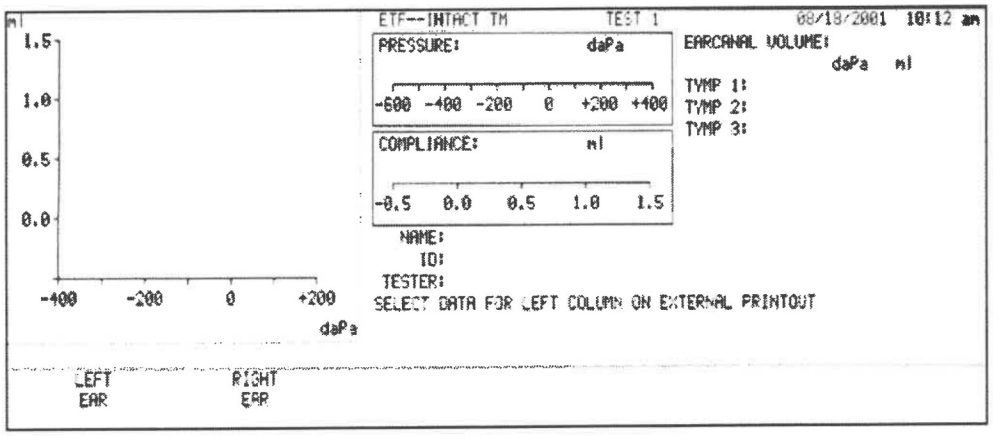
3) Press the PRINT FORMAT softkey, and then the MORE softkey to display the EXTERNAL PRINTER SETUP softkey selection.

4) Press the EXTERNAL PRINTER SETUP softkey to display the External Printer Setup Menu.



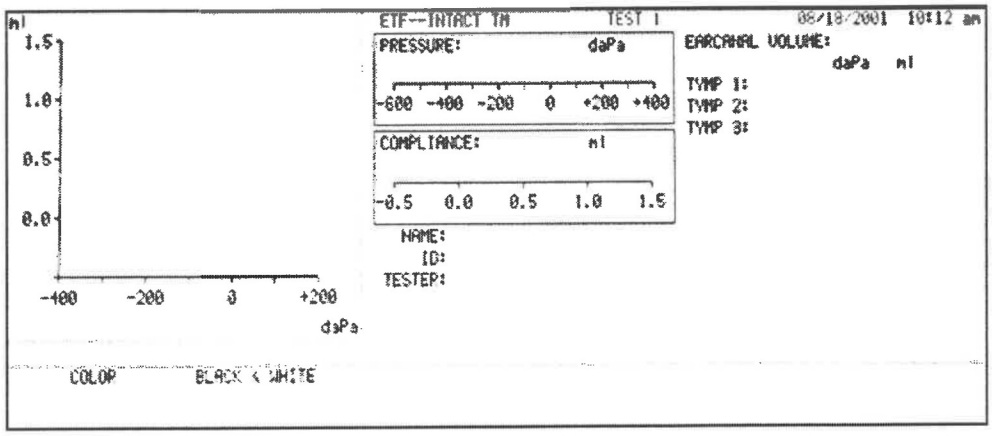
Left column printout data

5) Press the LEFT COLUMN SETTING softkey of the External Printer Setup Menu to set the left column of the printed data to the left or right ear.



Color or black and white

6) Press the PRINT TYPE softkey of the External Printer Setup Menu to set the printout to Black and White or Color.



NOTE

NOTE
The setting <u>must</u> be Black and White for grayscale printers.

Adjusting the display contrast

The contrast of the Liquid Crystal Display (LCD) can be adjusted to suit individual viewing tastes at any time by turning the LCD CONTRAST control, located at the left side of the enclosure.

Front panel controls

Front panel controls consist of a combination of "hardkeys" with fixed functions that do not change, and "softkeys" located under the LCD that change to support the changing requirements of a test session. A rotary pressure control is provided to change or fine-tune pressure within the ear canal.

Hardkeys

All of the push-button controls on the front panel are hardkeys. Three hardkeys are also located on the left and right sides of the LCD housing. Their functions are printed directly on the push-button or nearby on the panel and do not change. The front panel hardkey functions include:

Tymp

Causes GSI (or operator programmed) default criteria for diagnostic tymp test to be automatically set up.

Reflex

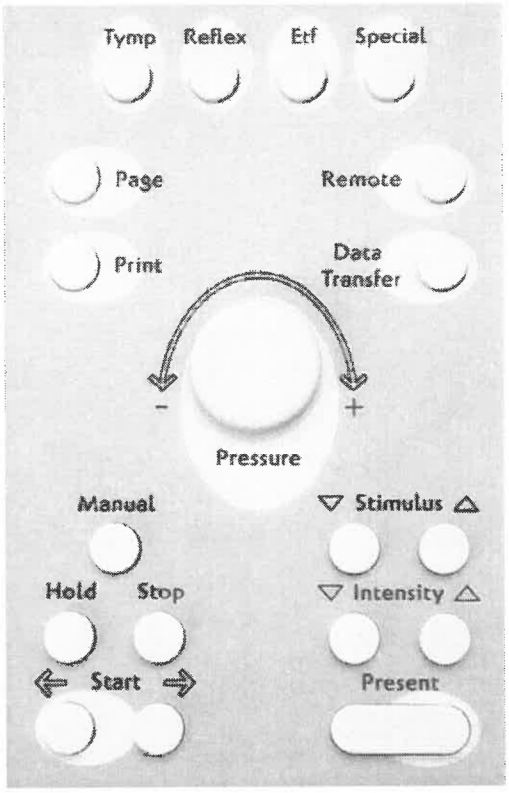
Causes GSI (or operator programmed) default criteria for reflex threshold testing to be automatically set up.

Etf

Causes GSI (or operator programmed) default criteria for eustachian tube function (intact eardrum) test to be automatically set up.

Special

Causes GSI TympStar to initialize to GSI (or operator programmed) default criteria for reflex decay test.



Page — Allows operator to recall and display tests in memory or in progress.

Print — Allows operator to print selected test results.

Remote — Used when GSI TympStar is interfaced with external computer. Implements a common handshake routine to ensure that the RS232 link is in place.

Data Transfer — Used to send test data to an external computer.

Pressure control — Rotary knob used to manually change or fine-tune the pressure within the ear canal.

Manual — Allows the user to run each applicable test procedure manually. The pressure control is used to change pressure manually within the ear canal.

Hold — Allows the current test sequence to be temporarily halted without venting the ear canal pressure.

Stop — Allows the current test sequence to be terminated. The ear canal is vented. Data on the current page is stored in memory.

Start — Causes the selected test sequence to begin in the direction indicated by the associated arrow.

Stimulus — Allows available stimuli to be scrolled up or down and selected. This feature is available only for Reflex type tests.

Intensity — Allows operator to select and set desired intensity (dB HL). This feature is available only for Reflex type tests.

Present — Allows selected stimulus to be presented either manually or according to preset automatic timing. This feature is available only for Reflex type tests.

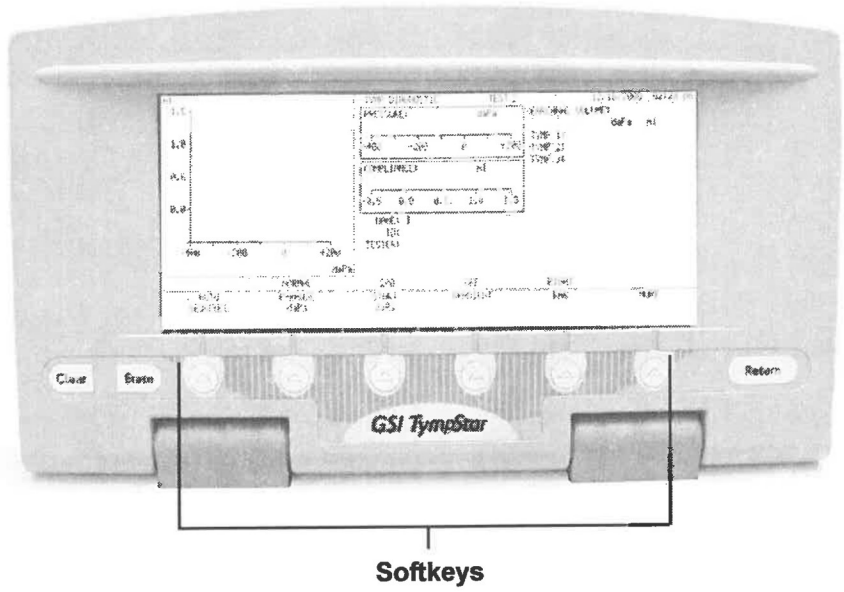
Three hardkeys are also located on the left and right sides of the LCD housing. Their functions are printed directly on the push-button and do not change. The LCD housing hardkey functions include:

Clear — Deletes selected tests stored in memory.

Erase — Erases current display of test results prior to placing test results in memory.

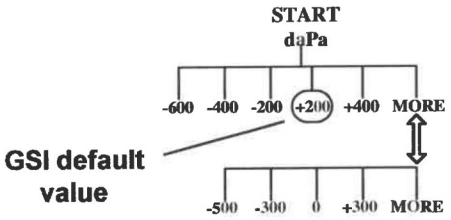
Return — Allows the operator to go back to next higher level in the softkey menu. Depressing Return while in Clear, Page, or Print mode restores the instrument to the mode previously selected.

Softkeys — Only the push-buttons located directly under the LCD are softkeys. Their functions are displayed on the LCD and change in support of the current test activities.



Menu diagrams — Menu structure diagrams like the diagrams shown on these pages will be used throughout the remainder of this manual as a convenience to the user.

GSI default parameter settings — GSI default parameters are circled on menu structure diagrams shown throughout the remainder of this manual.



Pre-Operation 3

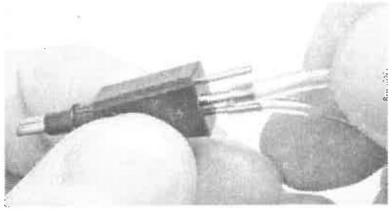
This chapter contains the following information:

- Cleaning probe tubes page 3-1
- Caring for eartips page 3-2
- Preparing test materials page 3-3
- Calibration checks page 3-3
- Instructing the patient page 3-17
- Suggested probe-insertion technique page 3-17

Cleaning probe tubes

To ensure measurement accuracy, it is essential to clean the probe tip daily to be certain that the tubes are clean and free of cerumen.

Remove the probe eartip and tygon tubing attached to the three metal probe tubes at the rear of the probe tip.



CAUTION!

CAUTION

Do not alter the length of the tubing by cutting it. When reconnecting the tygon tubing to the probe tubes, ensure that there are no sharp edges or burrs on the probe tubes that could cut the tygon tubing.

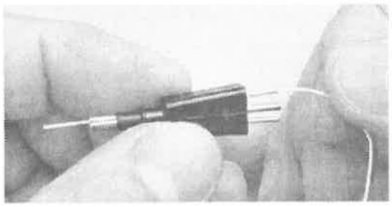
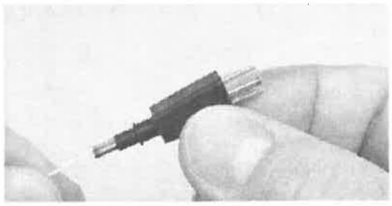
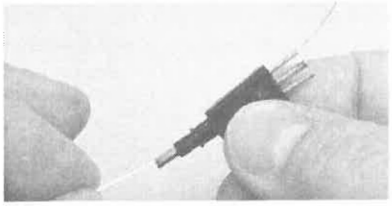
Using the cleaning wires shipped with your instrument, remove debris from each tube by pushing the wire through the tube from the back to the front of the probe tip as follows:

CAUTION!

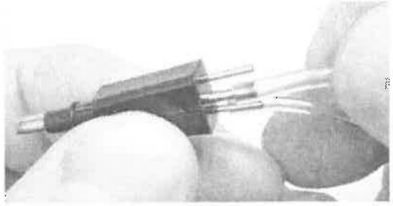
CAUTION

Avoid getting the probe moist. Clean the eartips separately. Do not place an eartip on the probe unless it is thoroughly dry.

Feed the stiff end of the cleaning wire into the tube and pull the wire completely through the tube. Discard the used wire. Repeat this process for each of the remaining probe tubes. Do not reuse wires.

Reconnect the tygon tubing to the probe tubes. The center tube has the larger diameter.



Caring for eartips

Eartips may be washed in warm, soapy water to remove cerumen. Use alcohol to disinfect eartips.

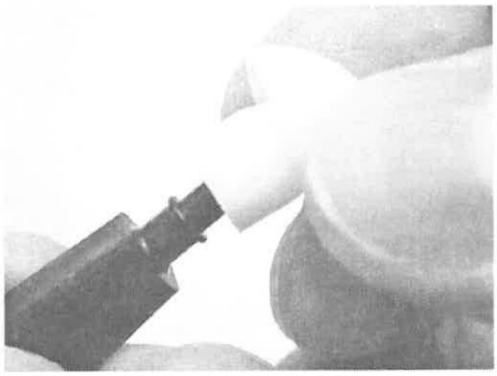
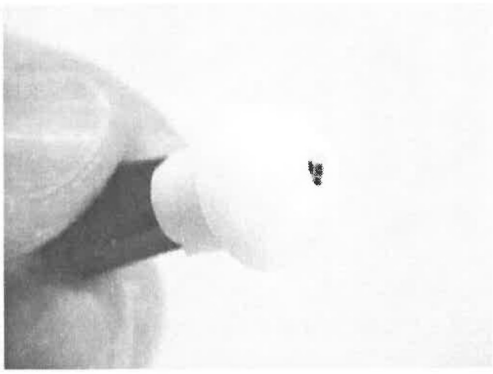
NOTE

NOTES
Store cleaned eartips only when they are completely dry.

Eartips may crack or otherwise deteriorate if permitted to remain submerged in alcohol for a long period of time.

Eartips can discolor if Zephiran Chloride is used in place of alcohol.

The eartip should be pushed firmly onto the tip of the probe until it is fully seated. The three probe tubes should be nearly flush with the top surface of the eartip.

Preparing test materials

The following items should be placed within easy reach prior to a test session:

- Otoscope
- Contra insert phone (8000-0078)
- A container for storing eartips
- A container for washing eartips
- Probe cleaning wire (2000-9610)
- A roll of printer paper (1700-9619)
- Calibration Cavity Assembly (2000-1035)
- Probe Box Mounts (Shoulder, Wrist, Clothes Clip)
- Several sets of eartips (1700-9660)
  (1700-9670)
  (1700-9620)

NOTE

NOTE
Do not attempt to use eartips of another manufacturer unless you are confident that using them will not create air leaks between the probe tip and eartip.

Calibration checks

Before using the instrument each day, use the test cavity provided with your instrument to check the calibration of the ml/mmho meter and graphic display at each sensitivity. A qualitative check of each test mode is also recommended. This is accomplished by listening to each test tone using the ipsi probe and contra phone.

Test cavity calibration

Cushion the probe box assembly and test cavity on the velcro shoulder mount provided. Rest it on your lap or in a nearby chair, away from instrument and other vibrations that may cause artifact and affect measurements.

NOTE

NOTE
If the GSI TympStar does not function properly during pre-operation checks or test routines contact your local GSI Representative or the GSI Service Department.

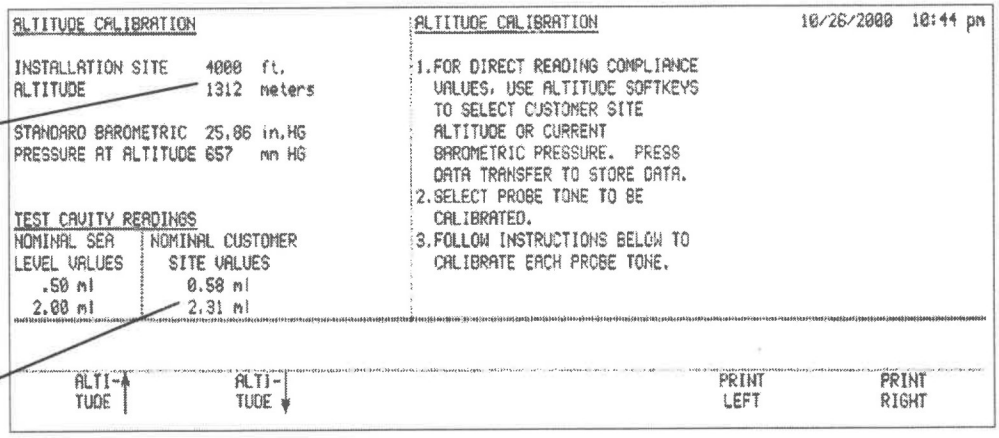
Insert the probe all the way into the test cavity when running a test.

1 cc = 1 ml
1 mmho = 10^{-8} m^3 /Pa.s

Altitude/Barometric pressure calibration

Altitude and weather (barometric pressure and temperature changes) affect admittance measurements due to the resulting changes in air density. These changes cause a shift in admittance readings. For example, the density of air molecules in a given volume decreases with dropping barometric readings or with increasing altitudes.

GSI calibrates the GSI TympStar to a barometric pressure of 760 mm Hg (30" of Hg) at 21 degrees C (70 degrees F). If your instrument has not been calibrated to your on-site altitude, perform the altitude calibration contained in Chapter 4: Altitude Calibration Mode. If you would like to verify that your instrument has been calibrated at your site's altitude, press the SPECIAL softkey, the RETURN hardkey, then the ALTITUDE CAL key. The Altitude Calibration screen will be displayed.



Altitude stored for your site

Equivalent (corrected) compliance values

If the altitude shown on the screen is correct, it is likely that your instrument is calibrated.

If the altitude shown on the screen is not correct, or if you would like to be absolutely certain of a valid altitude calibration, perform the calibration procedure contained in Chapter 4: Altitude Calibration Mode.

CAUTION!

CAUTION

Do not proceed with the calibration checks in this section unless you are certain that the altitude calibration for your instrument is valid at your location.

Equivalent compliance values

Equivalent (corrected) compliance values for pre-operation calibration checks at various altitudes are shown on the screen and in the table below. For example, if you are located at 4,000 feet, using the 226 Hz probe tone in the 2.0 cc cavity, the screen should show an altitude of 4000 feet, a site value of 2.31 ml and your test cavity measurement should read 2.31 ml (±0.1ml).

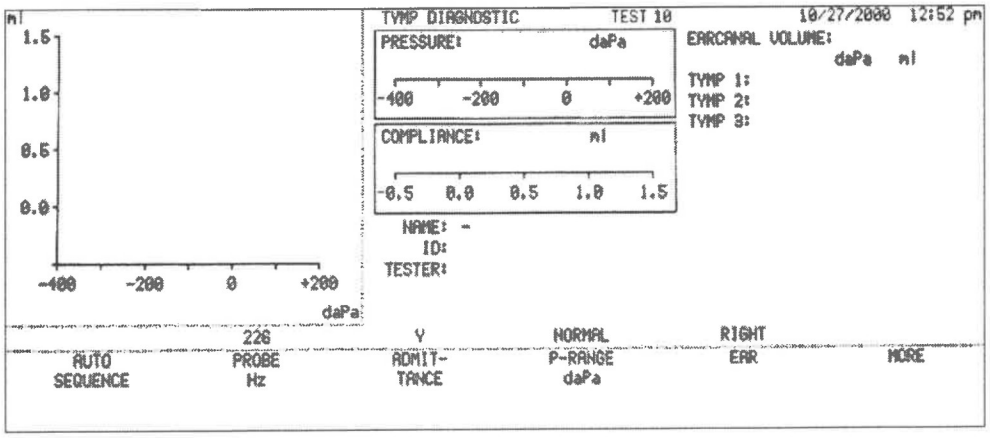
Equivalent Compliance Values									
Altitude (feet) 0	0	1000	2000	3000	4000	5000	6000	7000	8000
Small Vol (cc) 0.5	0.5	0.52	0.54	0.56	0.58	0.6	0.62	0.65	0.67
Large Vol (cc) 2.0	2	2.07	2.15	2.23	2.31	2.4	2.49	2.59	2.69

NOTE

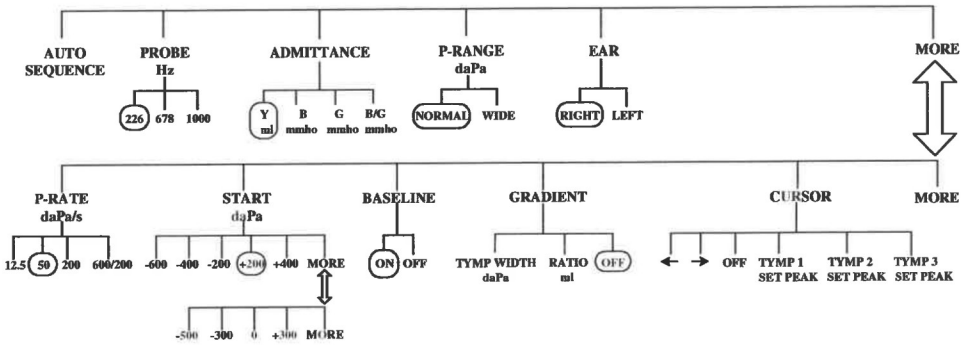
NOTE
The Table has been corrected for changes in altitude in reference to a 226 Hz probe tone.

Tracing/Meter Calibration check for Tympanometry

The Tymp Diagnostic screen and menus will be used for this calibration check.



Tymp Diagnostic screen

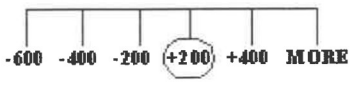


Tymp Diagnostic menus

To check the tracing/meter calibration for tympanometry:

1) In the Tymp Diagnostic mode place the eartip on the probe tip and listen to the 226 Hz probe tone. Depress the PROBE HZ softkey. Select 678 Hz and 1000 Hz respectively and listen for the probe tones.

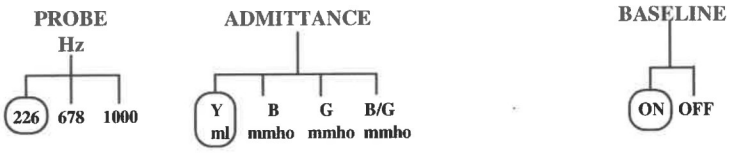
2) Depress the START daPa softkey at the bottom of the LCD. This sub-menu will appear. Press MORE to display the second level of the sub-menu.



3) Press the MORE softkey to display the following choices:

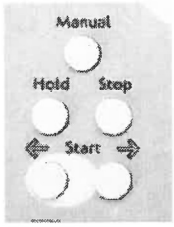
4) Press the 0 softkey to set 0 daPa as the starting pressure for the test. The display will return to the top menu level.

5) Confirm that the PROBE Hz setting is 226, the ADMITTANCE setting is Y and the BASELINE is ON. Use the PROBE Hz, ADMITTANCE and BASELINE sub-menus to change the settings if necessary.



6) Insert the ipsi probe tip into the 2.0 cc test cavity.

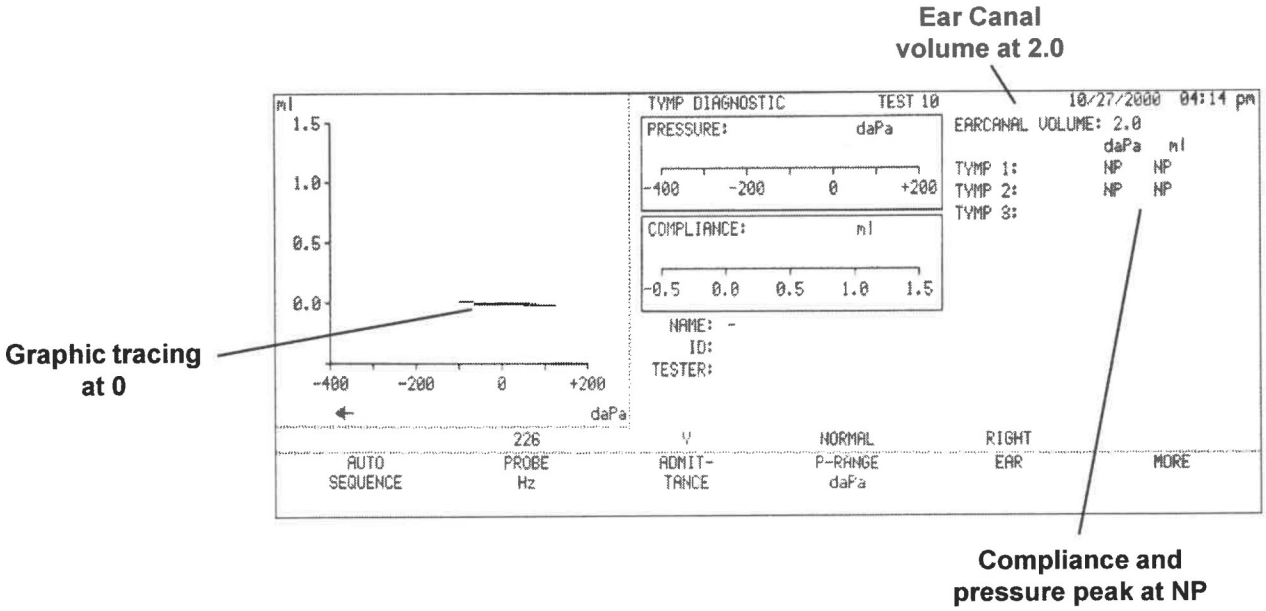
7) Press the START ➔ hardkey.



Allow the tracing to sweep to +100 daPa then press START ⬅ hardkey to reverse direction. Allow the tracing to sweep to -100 daPa and press the STOP hardkey.

The following results should be displayed:

- The graphic tracing should be at 0.0
- The EAR CANAL VOLUME should be 2.0 (within ± 5% of full scale).
- Compliance peak (ml) and pressure peak (daPa) values should be NP (No Peak).



8) Press the BASELINE softkey, then press OFF.

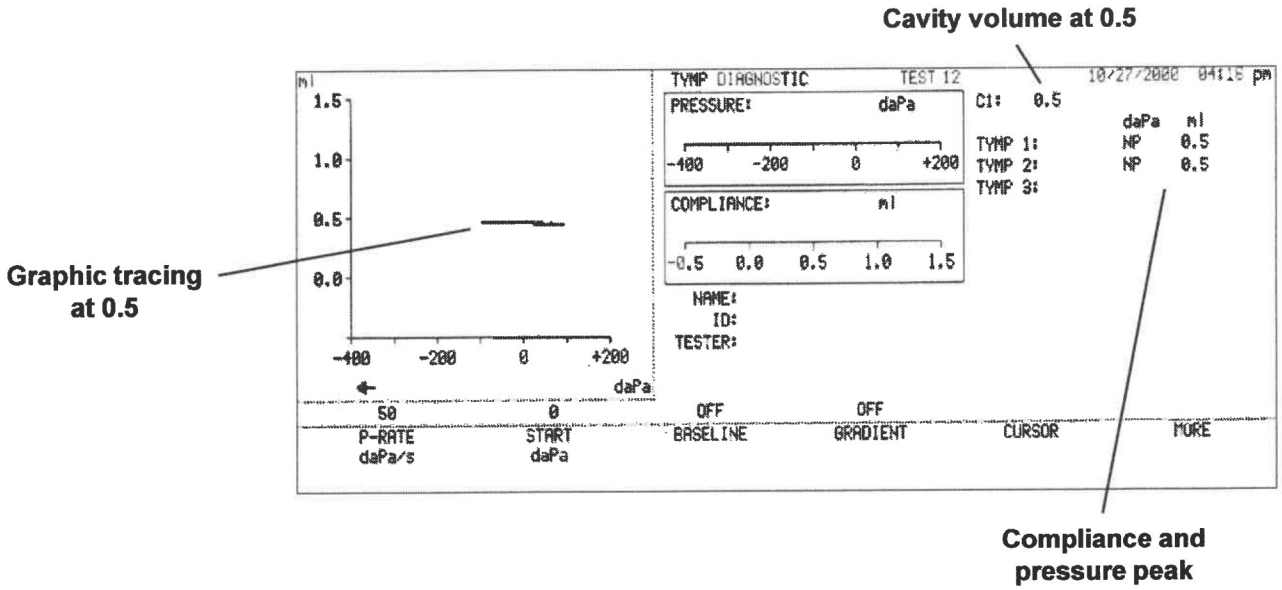
9) Insert the probe tip into the 0.5 cc test cavity.

10) Press the START → hardkey.

Allow the tracing to sweep to +100 daPa then press START ← hardkey to reverse direction. Allow the tracing to sweep to -100 daPa and press the STOP hardkey.

The following results should be displayed:

- The graphic tracing should be at 0.5
- The cavity volume (C1) should be at the 0.5
- The Compliance peak should be 0.5 (within ± 5% of full scale).
- The pressure peak (daPa) values should be NP (No Peak).



11) Insert the probe tip into the 2.0 cc test cavity.

12) Press the START → hardkey.

Allow the tracing to sweep to +100 daPa then press START ← hardkey to reverse direction. Allow the tracing to sweep to -100 daPa and press the STOP hardkey.

The following results should be displayed in the same manner as above:

- The graphic tracing should be at 2.0
- The cavity volume (C1) should be at the 2.0
- The Compliance peak should be 2.0 (within ± 5% of full scale).
- The pressure peak (daPa) values should be NP (No Peak).

13) Insert the probe tip into the 5.0 cc test cavity.

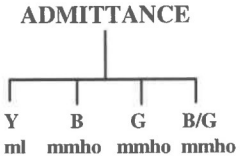
14) Press the START ➡ hardkey.

Allow the tracing to sweep to +100 daPa then press START ⬅ hardkey to reverse direction. Allow the tracing to sweep to -100 daPa and press the STOP hardkey.

The following results should be displayed in the same manner as above::

- The graphic tracing should be at 5.0
- The cavity volume (C1) should be at the 5.0
- The Compliance peak should be 5.0 (within ± 5% of full scale).
- The pressure peak (daPa) values should be NP (No Peak).

15) Press the ADMITTANCE softkey and select the B setting.

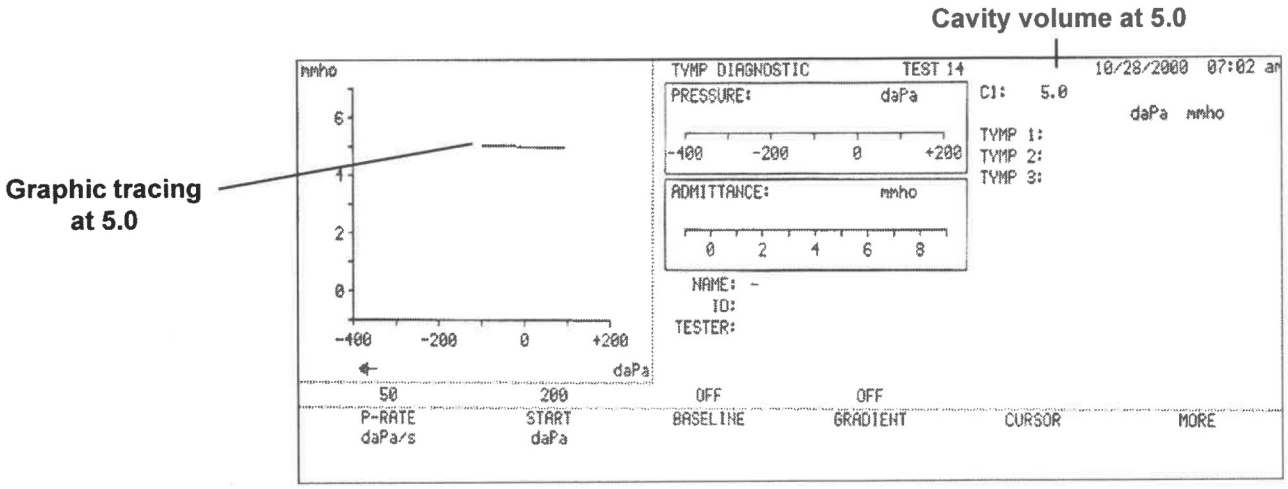


16) Press the START ➡ hardkey.

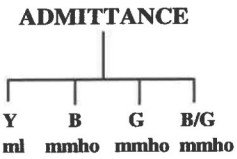
Allow the tracing to sweep to +100 daPa then press START ⬅ hardkey to reverse direction. Allow the tracing to sweep to -100 daPa and press the STOP hardkey.

The following results should be displayed without peak pressure and compliance values:

- The graphic tracing should be at 5.0
- Cavity volume (C1) should be 5.0



17) Press the ADMITTANCE softkey and select the G setting.

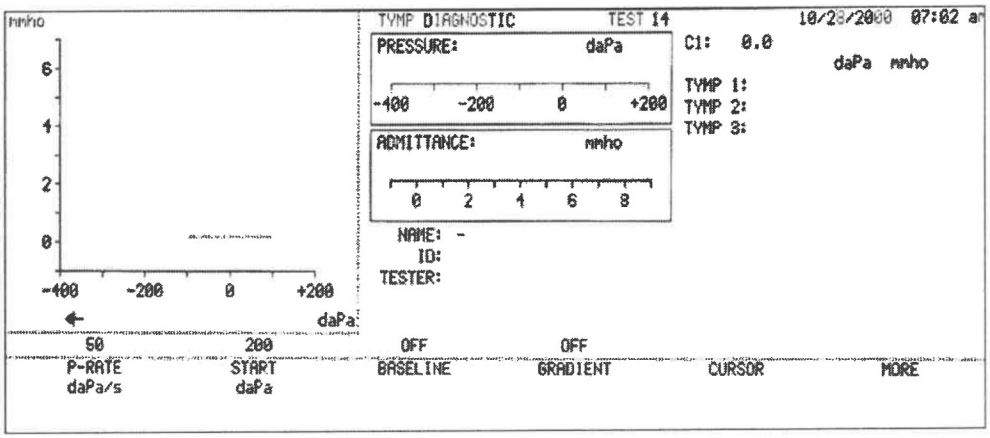


18) Press the START → hardkey.

Allow the tracing to sweep to +100 daPa then press START ← hardkey to reverse direction. Allow the tracing to sweep to -100 daPa and press the STOP hardkey.

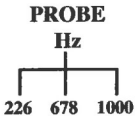
The following results should be displayed without peak pressure and compliance values:

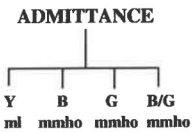
- The graphic tracing for G (dotted line) should be at 0.0
- The cavity volume (C1) should be at the 0.0



19) Check the Y and B admittance calibrations at 678 Hz in the 0.5 cc and 2.0 cc cavities by repeating the procedure explained in the previous paragraphs using the PROBE Hz and ADMITTANCE sub-menus.

The following results should be displayed without peak pressure and compliance values for the 0.5 cc cavity:





- The graphic tracing should be at 1.5
- Cavity volume (C1) should be 1.5

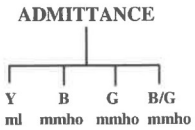
The following results should be displayed without peak pressure and compliance values for the 2.0 cc cavity:

- The graphic tracing should be at 6.0
- Cavity volume (C1) should be 6.0

NOTE

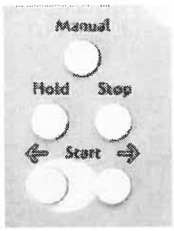
NOTE
When using the 678 Hz probe tone, the test cavity measurements with corrections for your on-site altitude should be 3X the values shown in the Equivalent (corrected) compliance values table on page 3-5. For example, if your test cavity measurement in the 2. 0 cc cavity reads 2.31 ml at 226 Hz, it should read 6.9 mmho at 678 Hz.

20) Press the ADMITTANCE softkey and select the G setting.



21) Insert the probe tip into the H.F. (678 - 2000 Hz) test cavity.

22) Press the MANUAL hardkey.

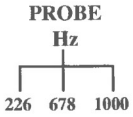


NOTE

NOTE
The H.F. test cavity is not a sealed cavity. It is, therefore, necessary to perform a quick check at 0 daPa to avoid a pressure leak.

The C1 value recorded and displayed should be in the 7.5 to 11.5 mmho range at sea level. Press the STOP hardkey.

23) Press the PROBE Hz softkey and select the 1000 setting, then press the MANUAL hardkey.



The C1 value should be the same as above.

24) Check the Y and B admittance calibrations at 1000 Hz in the 0.5 cc cavity by repeating the procedure explained in the previous paragraphs using the PROBE Hz and ADMITTANCE sub-menus.

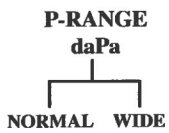
The C1 value recorded and displayed should be in the 2.2 mmho sea level. Press the STOP hardkey.

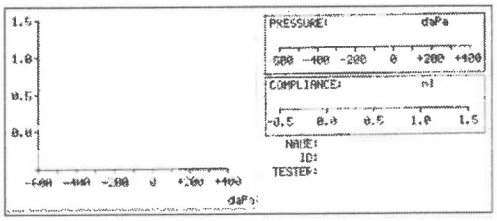
NOTE

NOTE
When using the 1000 Hz probe tone, values corrected for on-site altitude should be 4.4X the value shown in the Equivalent (corrected) compliance values table on page 3-5.

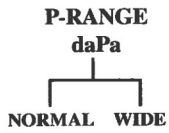
Pressure range check for tympanometry

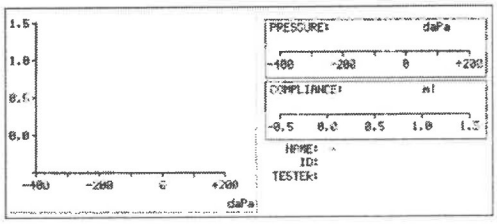
1) Press the P-RANGE daPa softkey, then select the WIDE pressure range. Check to insure that the X-axis of the graph and the pressure meter display a range of -600 to +400 daPa.



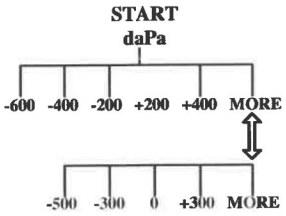


2) Press the P-RANGE daPa softkey, then select the NORMAL pressure range. Check to insure that the X-axis of the graph and the pressure meter display a range of -400 to +200 daPa.





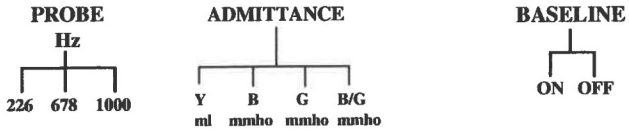
3) While in the NORMAL pressure range, press the START daPa softkey, and then select - 600 as the starting pressure. Note that the X-axis and meter ranges change to the WIDE pressure range values.



NOTE
The START daPa values override the normal pressure range selection.

Manual pressure check for tympanometry

1) Confirm that the PROBE Hz setting is 226, the ADMITTANCE setting is Y and the BASELINE is ON. Use the PROBE Hz, ADMITTANCE and BASELINE sub-menus to change the settings if necessary.

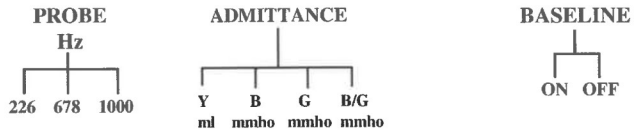


2) Insert the probe tip into the 2.0 cc test cavity, and press the MANUAL hardkey. The cavity size should be recorded as EAR CANAL VOLUME.

3) Rotate the PRESSURE KNOB and note the resulting change on the pressure meter and graphic display.

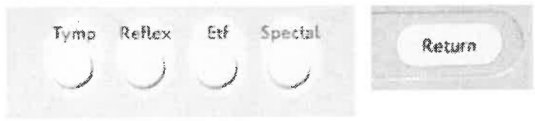
Screening reflex check - tymp screening

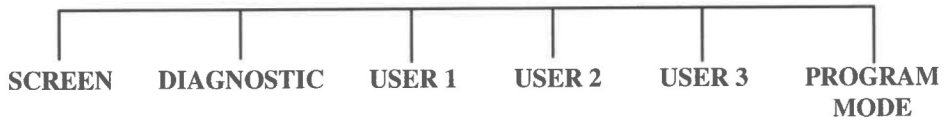
1) Confirm that the PROBE Hz setting is 226, the ADMITTANCE setting is Y and the BASELINE is ON. Use the PROBE Hz, ADMITTANCE and BASELINE sub-menus to change the settings if necessary.



2) Insert the ipsi probe tip into the 2.0 cc test cavity.

3) Press the TYMP hardkey, and then press the RETURN hardkey. The following sub-menu will be displayed:





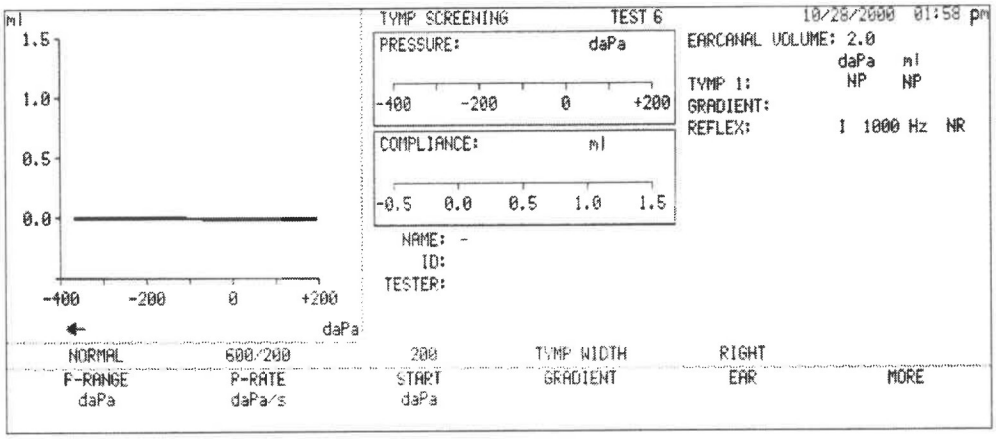
4) Press the SCREEN softkey. The tymp sweep will begin automatically upon pressurization of the test cavity.

The following results should be displayed:

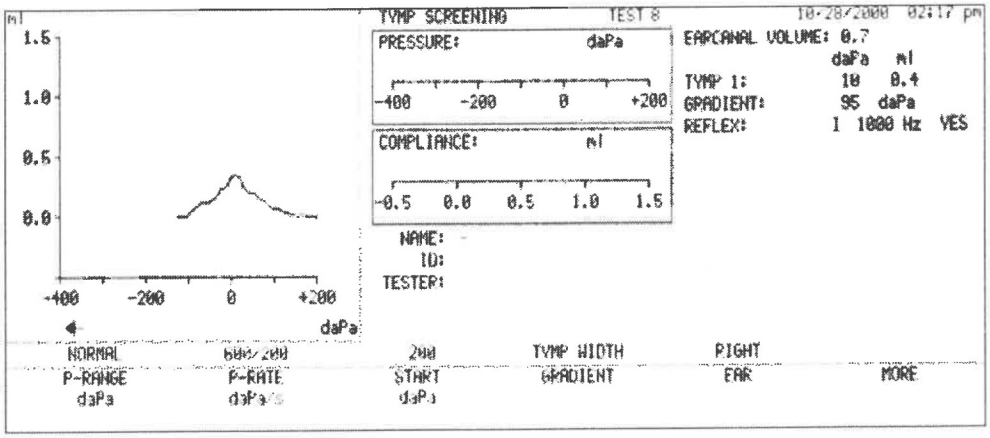
- The graphic tracing should be at 0.0
- EAR CANAL VOLUME should be 2.0
- TYMP should be NP
- REFLEX should be 1 1000 Hz NR

NOTE

NOTE
NR indicates No Reflex response for the stimulus presented.



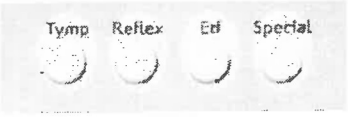
5) Place a screening eartip on the probe tip. Position the probe against the entrance of your ear canal applying a gentle pressure to maintain a tight seal. The screening test will begin automatically. Listen to the reflex test stimulus following the tymp test. The results will be displayed at the conclusion of the test.



Reflex threshold mode check

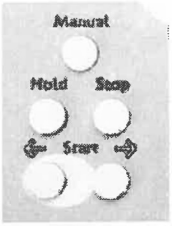
1) Insert the ipsi probe tip into the 2.0 cc test cavity.

2) Press the REFLEX hardkey.

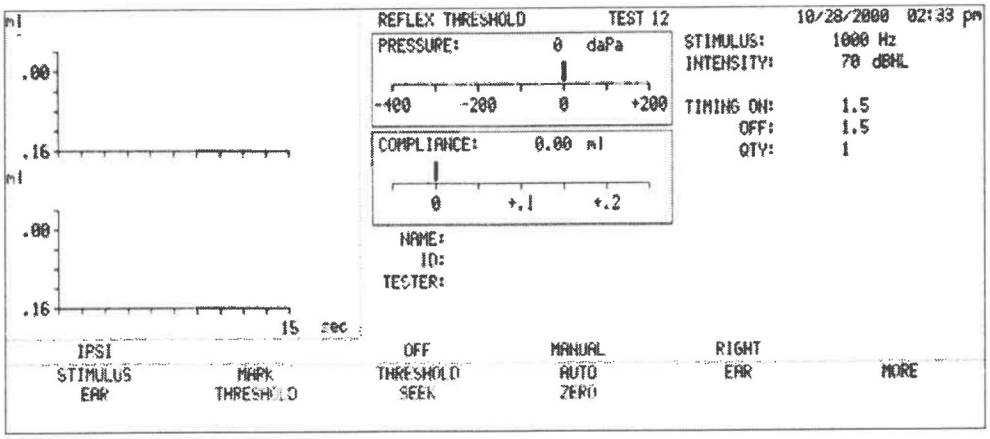


NOTE

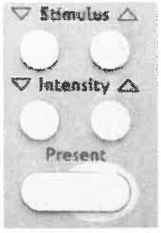
Remove the contra insert phone from the probe box. If the contra insert comes in close contact with the test cavity, acoustic radiation from the contra phone may cause artifact affecting the test cavity measurements.

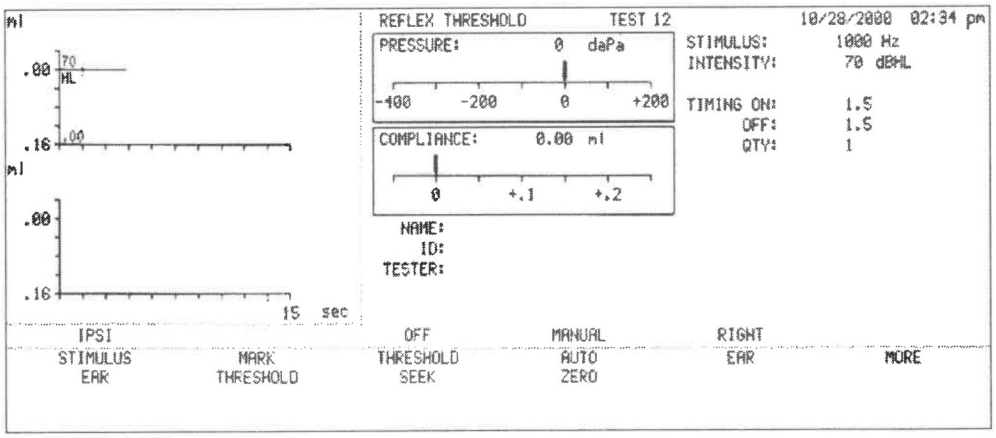


3) Press the START ➔ hardkey. The pressure meter reading will be 0 daPa, and the compliance will be zeroed automatically.

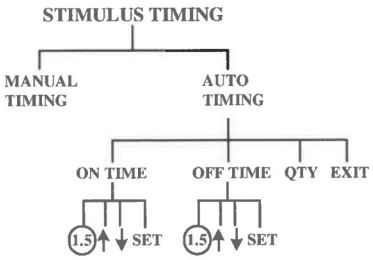


4) Press the PRESENT hardkey momentarily . A stimulus "ON" message will be displayed at the right upper corner of the screen and the tracing will sweep at the .00 ml position for the length of time automatically set.

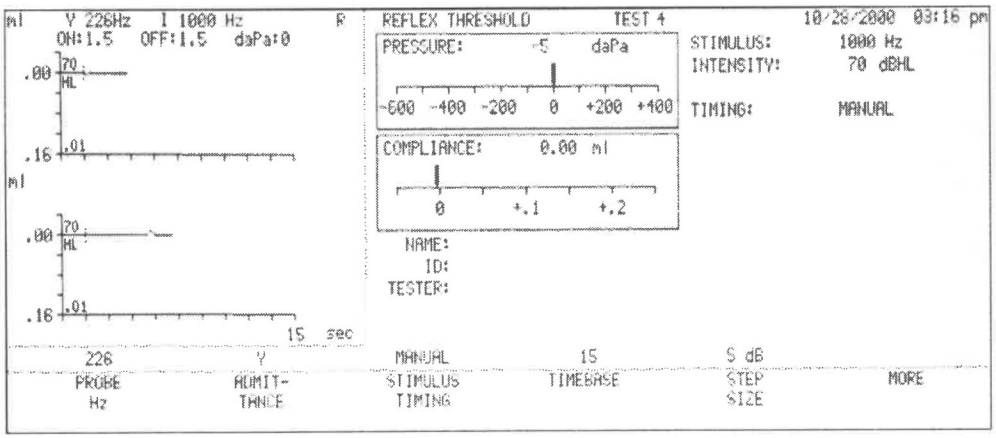




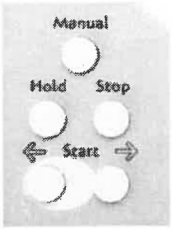
5) Press the STIMULUS TIMING softkey and select MANUAL TIMING.



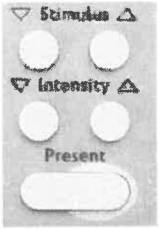
6) Press the PRESENT hardkey. A stimulus "ON" message will be displayed at the right upper corner of the screen and the tracing will sweep at the .00 ml position for the length of time automatically set.



7) Press the STOP hardkey.



8) To check the ipsi stimuli, place an eartip on the ipsi probe.

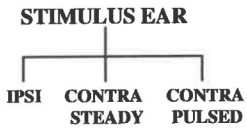


9) Select the 250 Hz stimulus in the upper right corner of the screen by pressing the STIMULUS hardkey.

10) Hold the ipsi probe against the outer portion of your ear canal and press the PRESENT hardkey. Listen for the time multiplexed tone (available in ipsi). Ascertain that the 226 Hz probe tone can also be heard.

11) Repeat the above procedure selecting 500, 1000, 2000, 4000 Hz, the three noise bands, and clicks.

12) Connect the contra insert phone to probe box. Ensure that the contra phone jack is firmly seated in the probe box receptacle. Place the eartip on the contra insert phone.



13) Press the STIMULUS EAR softkey, and select CONTRA STEADY.

14) Check the contra steady stimuli following the procedure described above for the ipsi probe.

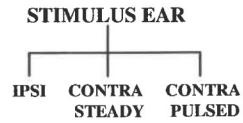
15) Press the STIMULUS EAR softkey, and select CONTRA PULSED.

16) Check the contra pulsed stimuli following the procedure described above for the ipsi probe.

17) Repeat the procedures described above for ipsi and contra probes at 678 Hz and 1000 Hz probe tones.

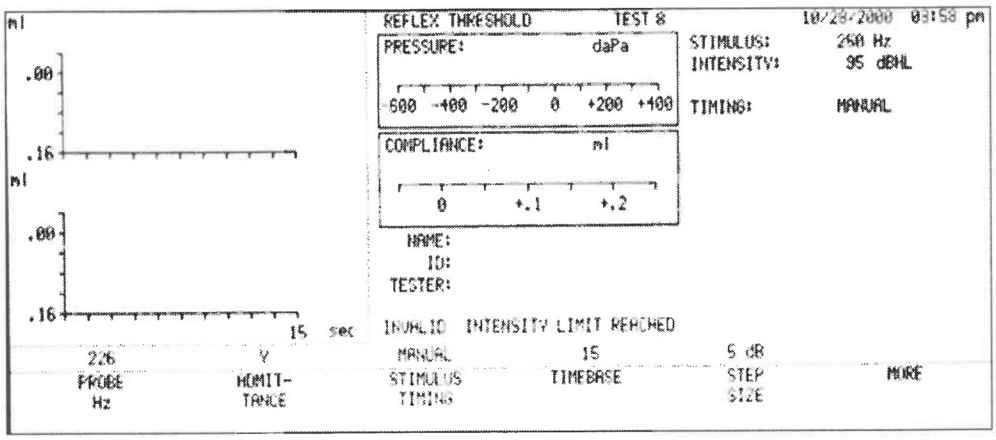
Intensity limits check for reflex threshold

1) Press the STIMULUS EAR softkey and select IPSI.



2) Select the 250 Hz stimulus in the upper right corner of the screen by pressing the STIMULUS hardkey.

3) Continuously increase the stimulus intensity by pressing the INTENSITY (up) hardkey. The "INTENSITY LIMIT REACHED" message will be displayed under the level meters at 95 dB HL.



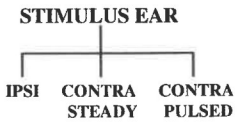
This message is displayed for intensity limits of:

- 95 dB HL for 250 Hz
- 110 dB HL for selected stimuli of 500 Hz & 1000 Hz
- 105 dB HL for selected stimulus of 2000 Hz
- 100 dB HL for selected stimulus of 4000 Hz
- 95 dB HL for noise bands
- 110 dB SPL for clicks

NOTE

Any signal intensity greater than 100 dB HL for the ipsi probe or contra phone causes the "HIGH INTENSITY SELECTED" message to be displayed.

4) Press the STIMULUS EAR softkey, and select CONTRA STEADY or CONTRA PULSED.



3) Continuously increase the stimulus intensity by pressing the INTENSITY (up) hardkey. The "INTENSITY LIMIT REACHED" message will be displayed at the following levels:

- 110 dB HL for selected stimulus 250 Hz (CONTRA PULSED ONLY)
- 120 dB HL for selected stimuli 500, 1000, 2000 Hz
- 115 dB HL for selected stimulus 4000 Hz
- 115 dB HL for noise bands
- 120 dB SPL for clicks

Instructing the patient

General

Explain to the patient that you are about to test their ears, and that unlike other audiometric tests, they are asked to refrain from speaking, excessive movement, and swallowing unless directed to do so. When testing children, it is often desirable to seat them so that they are able to watch the instrument as you conduct tests. This tends to increase their cooperation and lessens any feelings of apprehension.

Positioning the probe box

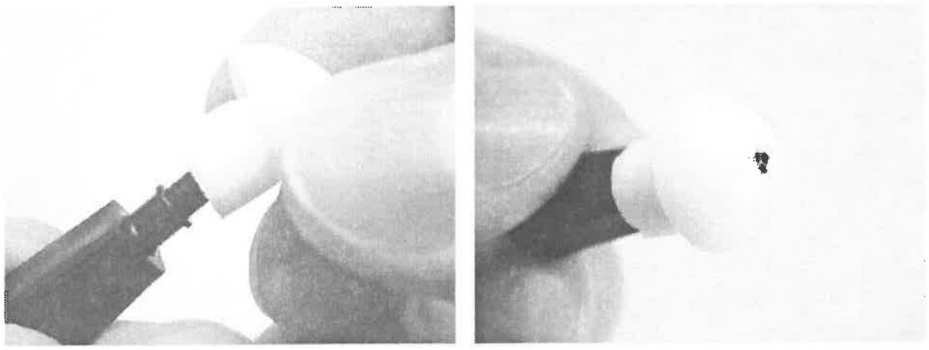
Position the shoulder mount for the probe box over the patient's shoulder on the same side as the ear to be tested. The velcro strip should be facing away from the body. The probe box is then positioned on front of the velcro strip.

Suggested probe insertion technique

Ear canal examination with an illuminated otoscope is an essential prerequisite to successful middle-ear testing. Such examination achieves the following:

- Detects the presence of potentially obstructive cerumen.
- Assists in determining the proper angle of probe insertion.
- Helps to determine the proper size eartip to achieve an airtight seal of the ear canal.

Select the correct size eartip and position it fully on the probe. The eartip should be pushed firmly onto the tip of the probe until it is fully seated. The three probe tubes should be nearly flush with the top surface of the eartip.



Insert the probe tip securely into the ear canal with a back-and-forth twisting motion. Pull the pinna upward and backward for adults, and down and back for children.

The probe tip should sit firmly within the ear canal without being held. If leakage occurs, a different size eartip may be needed.

If the wrist attachment is used for screening tests, the operator should wrap the wristband around their wrist with the velcro facing away from wrist. The probe box should be placed on top of the wrist with the LEDs visible to the operator. SCREENING EARTIPS should be used to achieve a hermetic seal when the probe tip is hand-held against the outer portion of the ear canal.

Operation 4

This chapter contains the following information:

- Overview of functions page 4-1
- Test procedures page 4-7
  - TYMP page 4-7
  - REFLEX page 4-28
  - ETF page 4-49
  - SPECIAL page 4-61
- Auto sequence tests page 4-87
- Instrument Options page 4-91

Overview of functions

Test and other functions

The four test modes of automatic or manual operation available are:

- TYMP
- REFLEX
- ETF
- SPECIAL

Tymp mode includes:

- Diagnostic Tymp
- Screening Tymp and Reflex (Automatic Only)

Reflex mode includes:

- Acoustic and Non-Acoustic Reflex Threshold.

ETF mode includes:

- Eustachian Tube Function for intact and perforated eardrums.
- Instrument Options

Special test mode includes:

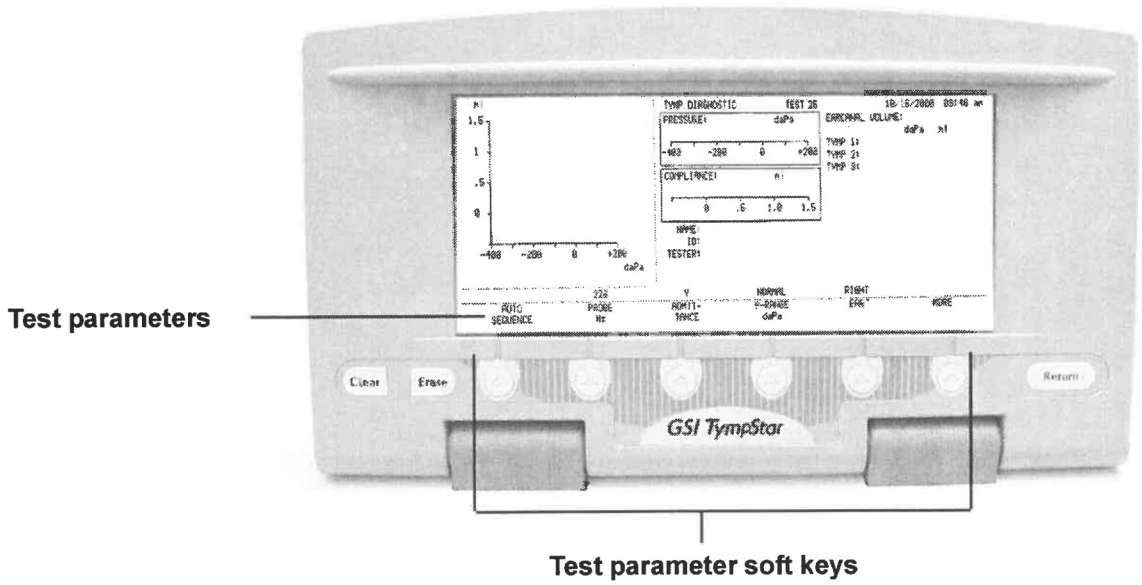
- Reflex Decay
- ARLT
- Acoustic Reflex Sensitization
- Multiple Hz
- Altitude Cal

Auto sequence tests can include:

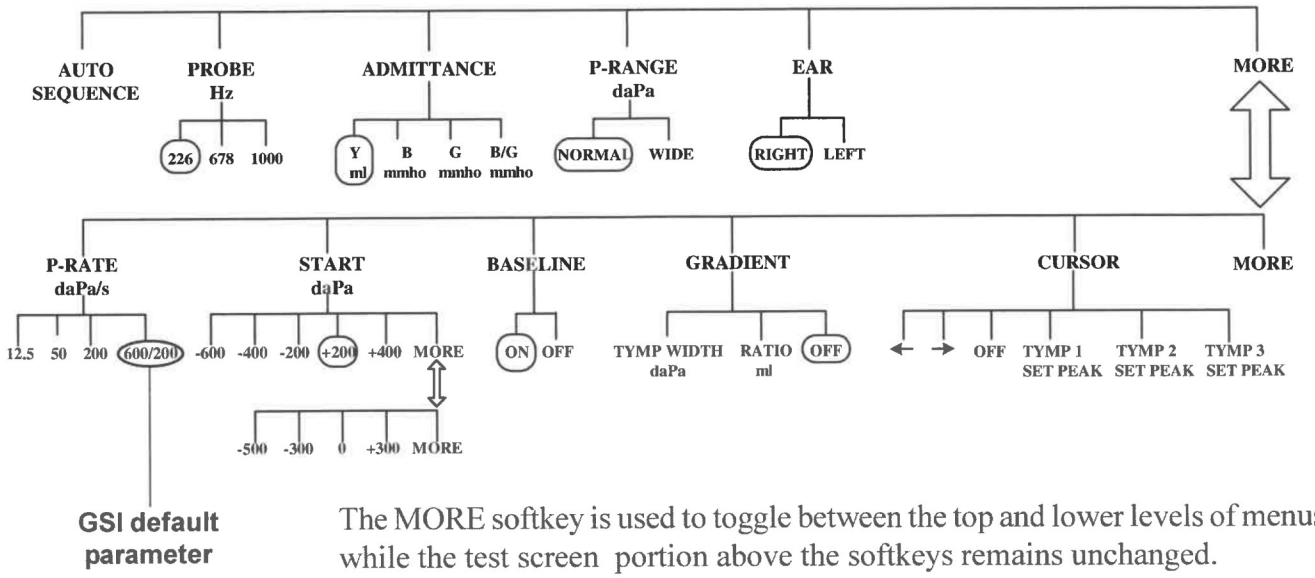
- Diagnostic Tymp
- Acoustic Reflex Threshold if desired
- Reflex Decay, if desired

Default parameters

GSI-developed default parameters for each selected test are displayed on the lower portion of the LCD above the six softkeys. Alternative choices may be made by pressing the appropriate test parameter softkey.



Pressing a test parameter softkey causes a new menu of choices to be presented across the bottom of the screen for that function. The menu structure for the Tymp diagnostic functions is diagrammed below as an example:



The MORE softkey is used to toggle between the top and lower levels of menus while the test screen portion above the softkeys remains unchanged.

NOTE
The GSI default parameters are circled on the menu structure diagrams.

Program modes

All test modes allow the user to individually program a unique set of default test parameters. User-programmed parameters override GSI-developed default parameters.

Probe tone frequencies

The following probe tone frequencies are available:

- 226 Hz - All Tests
- 678 Hz - Tymp Diagnostic, Reflex Threshold, Reflex Decay, ETF
- 1000 Hz - Tymp Diagnostic, Reflex Threshold, ETF
- 250 Hz - 2000 Hz Sweep - Multiple Frequency Tympanometry

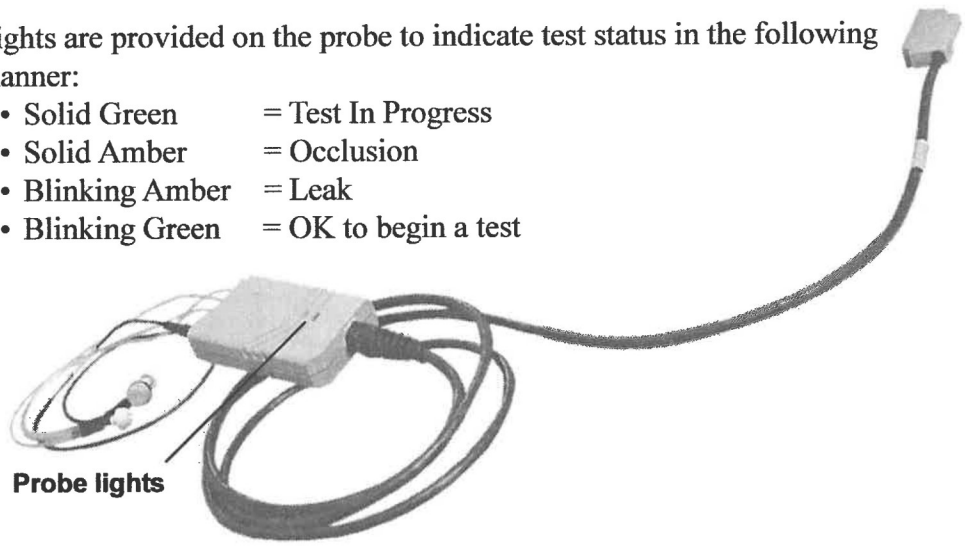
LCD graphic traces

The TympStar Version II measures admittance (Y), and its components: Susceptance (B) and Conductance (G). Admittance (Y) and Susceptance (B) tracings are solid lines, while tracings of conductance (G) values are dotted lines.

Probe lights

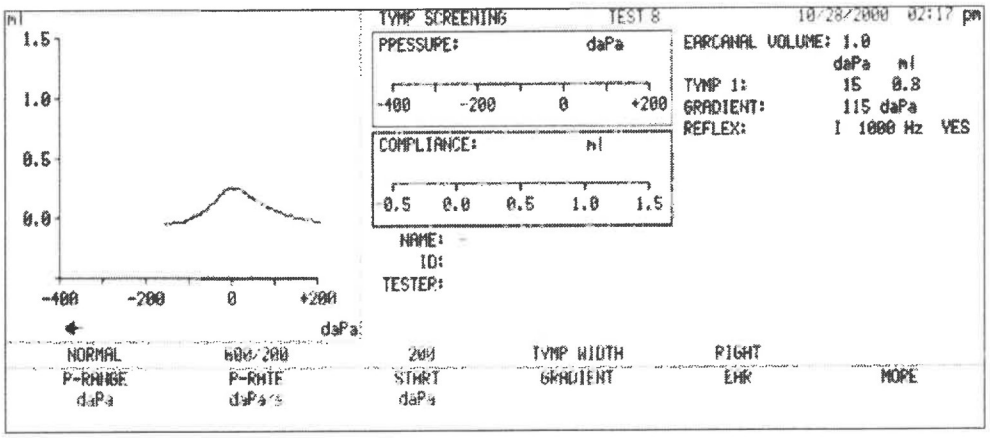
Lights are provided on the probe to indicate test status in the following manner:

- Solid Green = Test In Progress
- Solid Amber = Occlusion
- Blinking Amber = Leak
- Blinking Green = OK to begin a test

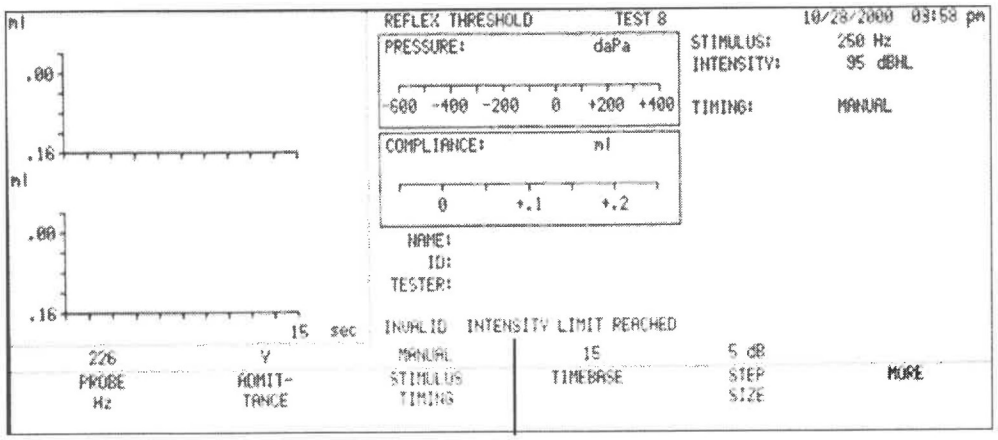


LCD screen

The liquid crystal display (LCD) shows axes for the graphic display of the selected test, and pressure and admittance meters.



THE TEST STATUS line to the right of the graphics area of screen displays alert messages, invalid selections, and other messages to user.



Test Status Line

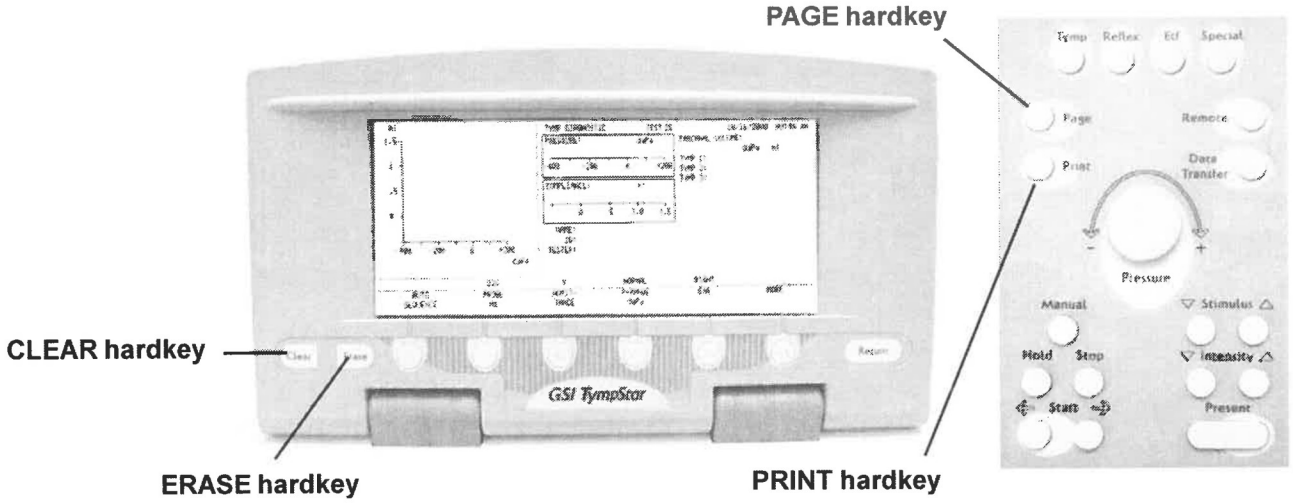
Test tracings, meter displays with digital readouts, and ear canal volume are recorded in real time.

NOTE

A 226 Hz Y tympanogram is displayed on the LCD screen in a 1:1 aspect ratio and on the external VGA monitor in a 1.4:1 aspect ratio. The Pressure (horizontal) axis appears to be "stretched out" by 40% on the VGA monitor.

Erasing and clearing test data

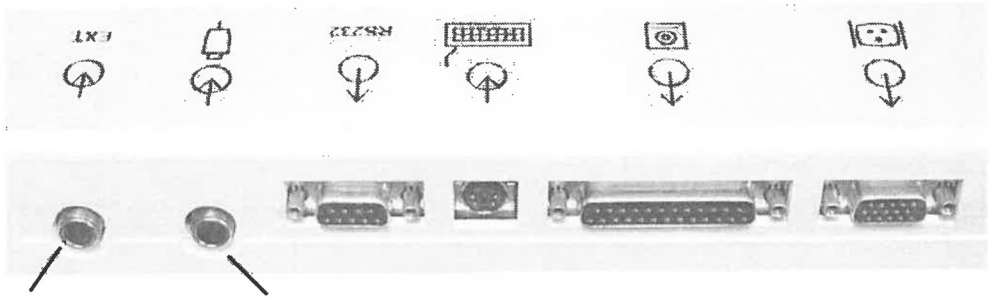
The display of current test data may be erased prior to stopping a test or continuing to the next test by pressing the ERASE hardkey. Previous test data can be selectively cleared from the instrument's storage by selecting the desired test with the PAGE hardkey, then pressing the CLEAR hardkey



It is suggested that all testing be completed on one ear before proceeding to the other ear. Changing the test ear causes a new page of test data to be generated.

External reflex test stimuli

Reflex test stimuli may be input from an external source and presented via external control. The connections for these external inputs are provided on the rear panel. Refer to Appendix A: Specifications for details.



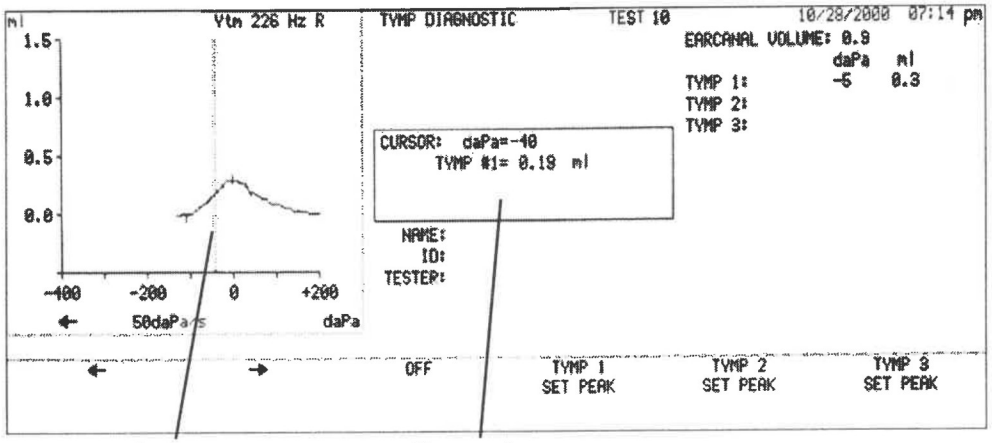
Paging test data and the cursor

Up to 26 test screens can be stored in memory as "pages". These pages of data can be recalled with appropriate titles and labels for viewing by pressing the PAGE hardkey, then scrolling through pages using up/down arrows. Each screen of data equals a page.

A cursor is available on all test data pages for scrolling left or right on the graphics area and can be used to set or reset tymp peak values for tests. A cursor box describes the numeric position of the cursor on both the X and Y axes.

NOTE

NOTE
The cursor must be used to set tymp values when testing at anything other than 226Hz, Y.



Printing tests

Up to 26 test screens stored in memory can be printed by selecting PAGE-ALL followed by PRINT. Individual test results can be printed by selecting PAGE and then using the arrow key to display the test. To begin printing, press the PRINT hardkey.

Test results can be printed in graphical or tabular format. Please refer to the Instrument Options section at the end of this chapter for more information.

Error codes and problem reporting

If a problem is encountered during operation that causes the control processor or signal processor to shut down, an alert message will appear on the screen with a code number. The code number indicates the source of the problem. PRINT the displayed code for reference when reporting an operational failure before you attempt to RESUME testing. Report repeated operational failures to your local representative, or to the GSI Service Department.

Test procedures

Tympanometry (Tymp Mode)

Tympanometry provides an objective means for determining the amount of mobility present within the eardrum and the ossicular chain. It is, however, important to keep in mind the fact that the amount of mobility present within the ossicular chain may be camouflaged by a scarred or thickened eardrum.

Acoustic energy, commonly referred to as the probe tone (226 Hz, 678 Hz or 1000 Hz) is introduced into a hermetically sealed ear canal by means of a loudspeaker located within the probe box. The intensity of this tone is monitored via a microphone, also located within the probe box. Measurements are taken at fixed time intervals.

As pressure within the ear canal is varied, the eardrum is subjected to varying degrees of stress which alters mobility of the eardrum. Maximum mobility will occur when the pressure on both sides of the eardrum are equal. Changes in mobility of the eardrum tend to produce changes in the probe tone level within the ear canal. Probe tone intensity changes indicate the amount of sound energy entering the middle ear.

Admittance is calculated based on these measurements. Since the sound pressure level of the probe tone within the ear canal varies as a function of mobility, it is possible to record these changes in mobility as a function of pressure. While the recording is visualized in the horizontal direction (X-axis) as a function of differential pressure across the eardrum, the tracing also moves in the vertical direction (Y-axis) as a function of mobility or admittance of the middle ear system. A graphic presentation of this information is known as a tympanogram.

Two component tympanometry

Two approaches have been used to describe middle ear function - impedance and admittance. The components of impedance are resistance and reactance. Acoustic resistance refers to the amount of sound energy dissipated within the middle ear system due to friction and cochlear consumption. The viscoelastic properties of tendons and ligaments, the viscosity of perilymph and the mucosa, and the narrow air passages of the middle ear contribute to resistance. Reactance refers to the amount of energy stored and then reflected from the middle ear system. The reactive component is composed of mass and stiffness. The ossicles and perilymph in the cochlea contribute as mass components of reactance. The ligaments, tendons, tympanic membrane, and enclosed air contribute to the stiffness of the system.

It is not possible to measure impedance directly because it is an intangible quantity that must be arrived at inferentially. Therefore, Admittance "Y", the reciprocal of impedance, is generally measured instead. The two components of Admittance are Conductance "G" which is the reciprocal of resistance, and

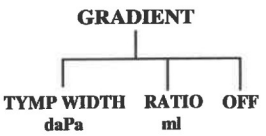
Susceptance "B" which is the reciprocal of reactance.

The response of the middle ear system to an acoustic stimulus such as the probe tone may be measured as a response of the system as a whole, or measured as the response of each component which contributes to the total response. A measurement of the total response provides an "overview" of how the middle ear system responds to the probe tone without providing any information about the status of each component. If the tympanic membrane is normal, a measurement of the total response at 226 Hz provides sufficient data to assess middle ear function. However, if a tympanic membrane abnormality exists, it camouflages or masks the true status of the middle ear (i.e. an otosclerotic condition may be masked by a hyperflaccid eardrum). In this case, a measurement of each component will yield more detail regarding the total state of the middle ear system. This is particularly true with probe tone frequencies of 678 Hz or above.

With a probe tone frequency of 226 Hz, the normal middle ear system acts as a stiffness controlled system. The resistive (conductance) component contributes very little to the total system response. Thus, a measurement of Susceptance (primarily compliance in this case) will be very close to the total admittance measurement at 226 Hz. ("Y" approximately equals "B"). Since the compliance of the middle ear can be calibrated with respect to the compliance within an equivalent volume of air in ml or cc, it is also possible to measure admittance at 226 Hz in ml or cc. However, this is only true at 226 Hz. When higher probe tone frequencies are used, the middle ear no longer acts like a stiffness controlled system. Mass components become more significant. Notching will appear in the tympanogram as resonance is approached providing valuable diagnostic information. At the resonance frequency of the middle ear system stiffness and mass are equivalent. At frequencies above resonance the middle ear system acts as a mass controlled system. Middle ear pathologies alter the resonant point of the system. A measurement of the contribution of each component at the higher probe tones provides valuable information about the status of the middle ear system. Admittance in such cases is measured in acoustic mmhos. (1 acoustic mmho = 10^{-8} m^3/Pa.s)

Gradient

The Gradient function can be activated from the Tymp menu by pressing the GRADIENT softkey in the TYMP menu, then selecting the TYMP WIDTH or RATIO method of calculating the gradient value.

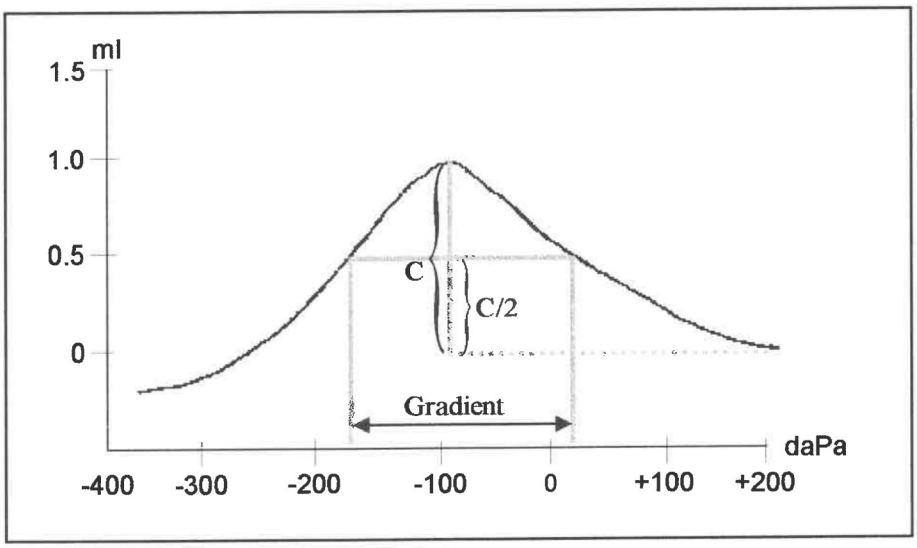


NOTE

Gradient can only be selected when testing at 226 Hz, Y.

Tymp width method

When TYMP WIDTH is selected, tympanometric gradient will be determined and displayed numerically below the compliance and pressure peak data. TYMPANOMETRIC GRADIENT is a quantitative description of the shape of a tympanogram in the vicinity of the peak. The gradient calculation is based on determining the width of the tympanogram in decaPascals (daPa) at one half, or 50% of the amplitude (height) of the tympanogram as shown below:



Tymp width method of calculating gradient

Normative gradient values †

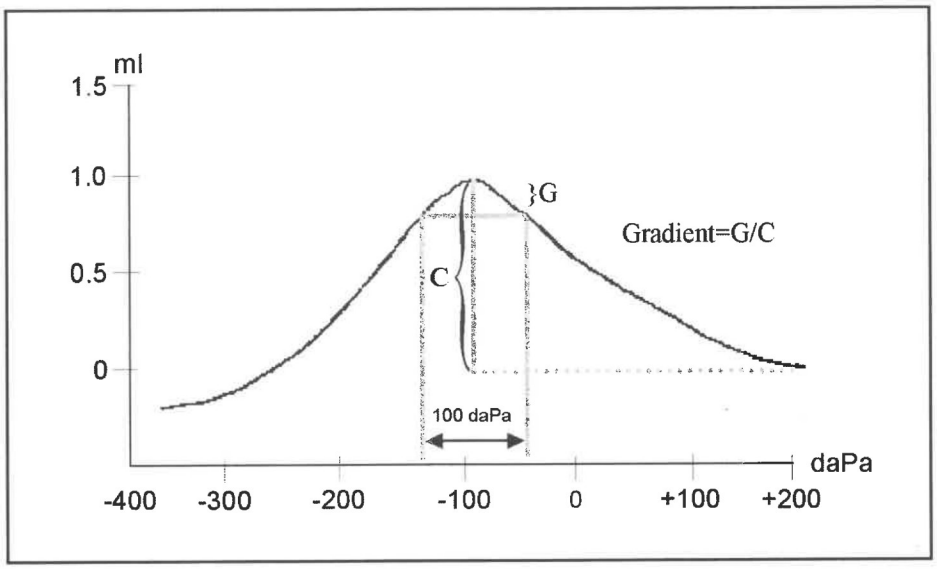
Children (3-5 years of age)	60-150 daPa
Adults	50-110 daPa

† American Speech Language Hearing Association (1990). Guidelines for screening for Hearing Impairments and Middle Ear Disorders. ASHA (suppl. 2), 17-24.

Ratio method

A second formula for the calculation of gradient may be selected by pressing the GRADIENT hardkey, then selecting RATIO. Brooks (1969) defined gradient as the change in 'compliance' from peak value to the value obtained at a pressure interval of 50 daPa on either side of the peak as shown below.

RELATIVE GRADIENT is determined by dividing "G" (the compliance of the tympanogram from peak to a horizontal line with intersection points on the tympanogram at an interval of 100 daPa) by "C" (the compliance measured from start pressure of the tympanogram to the compliance peak). The GSI TympStar Version II calculates "G" as the average of the compliance points at an interval of ±50 daPa.



Ratio method of calculating gradient

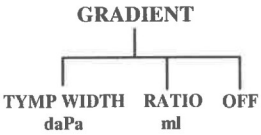
Normative gradient values † †

Greater than 0.2

† † Fiellau-Nikolajsen, M., "Tympanometric and Middle Ear Effusion: A Cohort Study in Three-Year-Old Children.", Int. J. Ped. Otorhinolaryngology, (1980), 2: 39-49.

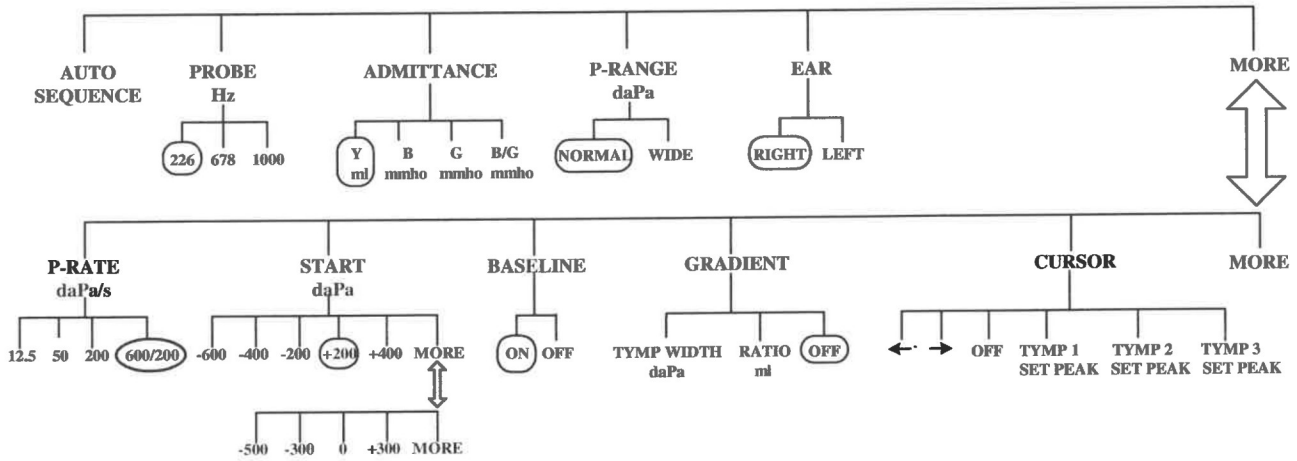
Selecting the gradient method

To select the gradient calculation to be used as part of a tymp measurement, press the GRADIENT softkey in the TYMP menu, then press the TYMP WIDTH or RATIO sub-menu softkey.



Tymp diagnostic softkey menu structure

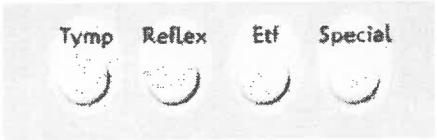
The structure of Tymp Diagnostic softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.



Tymp diagnostic softkey menu structure

Automatic tympanometry test procedure

1) Select the Tymp test mode if necessary by pressing the TYMP hardkey.



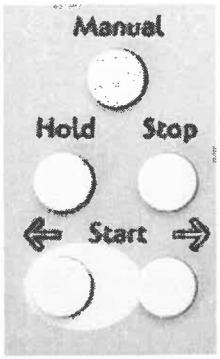
NOTE
The instrument automatically initiates the Tymp Diagnostic test mode when power is applied.

2) Attach the probe box to the velcro strip on the shoulder mount or clothes clip and position it on the patient.

3) Position the appropriate size eartip on the probe tip and securely insert it in the ear canal to obtain a hermetic seal.

4) Press the EAR softkey to select the right or left ear. Navigate through the softkey menus shown above and change parameter settings for the test as required.

NOTE
Changes to default parameters remain selected until the system power is turned off or if a different test mode hardkey is selected.



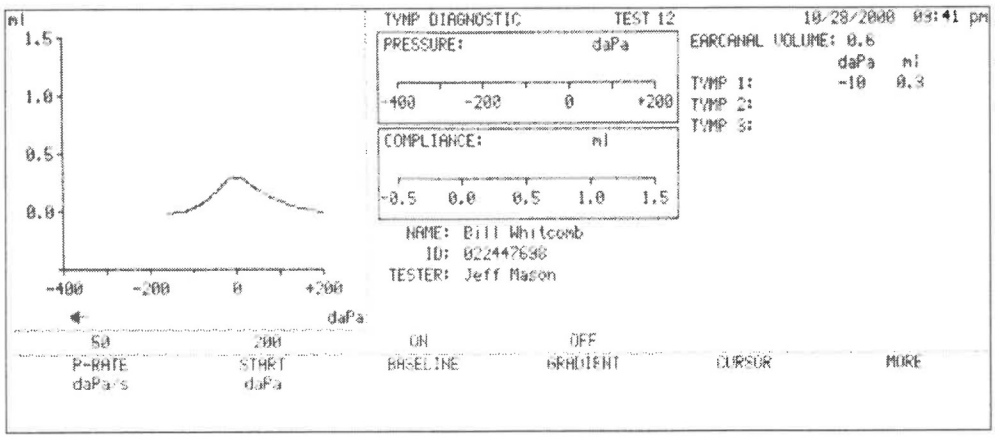
5) Press the ← START hardkey to pressurize the ear canal to selected start pressure and initiate collection of tymp data from a positive to negative direction. START → initiates data collection from a negative to positive direction.

NOTE

The START daPa pressure selection overrides the P-RANGE daPa pressure range choice. For example, if the current P-RANGE is set at NORMAL (-400 daPa to +200 daPa), the user can still select + 400 daPa as the starting pressure for a test. The START daPa pressure setting can be changed while in STOP.

6) If the occlusion message appears on the LCD, the probe tip should be examined for the presence of cerumen.

7) If the leak message is displayed, attempt to reposition the probe, or select an alternate size eartip



8) View ongoing test results on the graphic display area, and on the pressure and admittance meters. The Y-axis of the graph is labelled in ml of equivalent compliance at Y 226 Hz. All other probe tone and component measurements are labelled in mmhos as admittance. The X-axis, or pressure axis, is labelled in daPa (1 daPa air pressure = 1.02 mm H_20). Specifications comply with the current ANSI Middle-Ear Standard.

9) The pressure sweep continues to the end of the pressure range and automatically enters HOLD. The HOLD hardkey can be pressed prior to completion of the sweep.

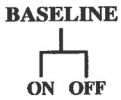
10) Otherwise, the numeric measure for ear canal volume is displayed in real time at the right of the level meters.

Up to three tympanograms can be run on one test screen when Y, B or G is selected. If B/G is selected, no further tracings are allowed.

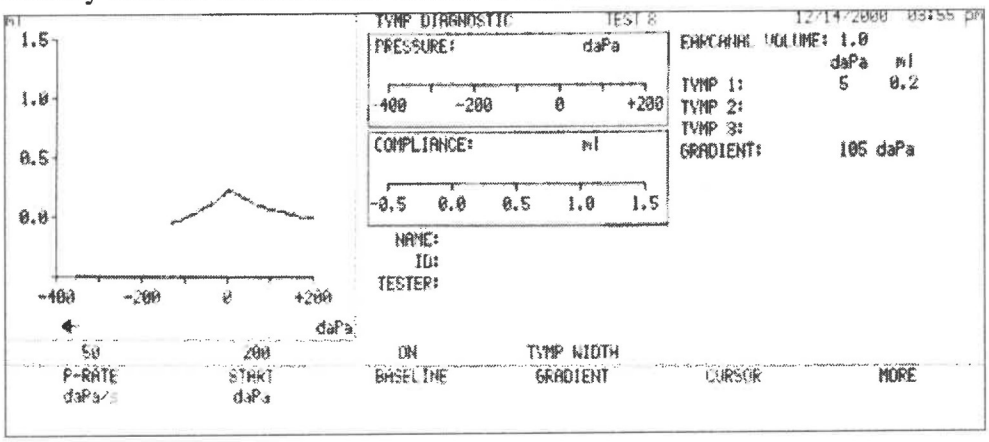
Sweep direction

The direction of the pressure sweep may be reversed via selection of the appropriate ◄ START ► hardkey. An arrow below the X-axis of the graphic trace indicates the direction of the pressure sweep for the last tymp tracing.

Tymp test: Y at 226Hz
Baseline ON

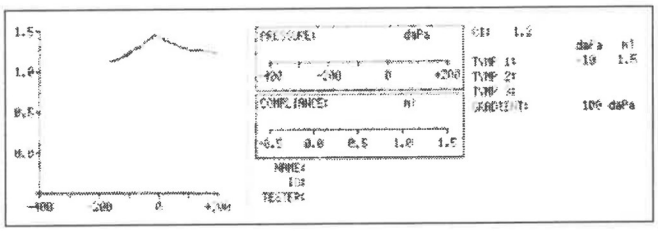


Upon completion of a pressure sweep, or reversal of direction, numeric values for compliance peak (ml), pressure peak (daPa), and gradient (if selected) for the last tymp run appear as summary data to the right of the meter area on the LCD as shown below. With the Baseline on, it is possible to read the tymp peak compliance value directly because the ear canal volume is removed from the measurement.



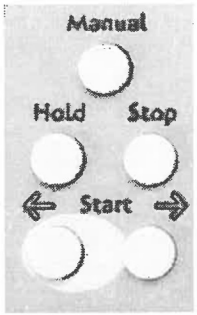
Baseline OFF

When the baseline function is off, the label C1 appears in place of ear canal volume indicating compliance at start pressure.



With the Baseline off, it is not possible to read the static acoustic compliance directly. In this case the tymp peak compliance is calculated by subtracting C1 from the tymp ml value (static acoustic compliance = tymp ml - C1).

Stopping the test



11) Pressing the STOP hardkey ends the tymp test. Further tymp data cannot be stored on that page. STOP is automatically entered upon completion of the third pressure sweep.

The user may abandon automatic testing by pressing the STOP hardkey at any point for difficult to test patients. The Manual mode may be entered as described later in this section.

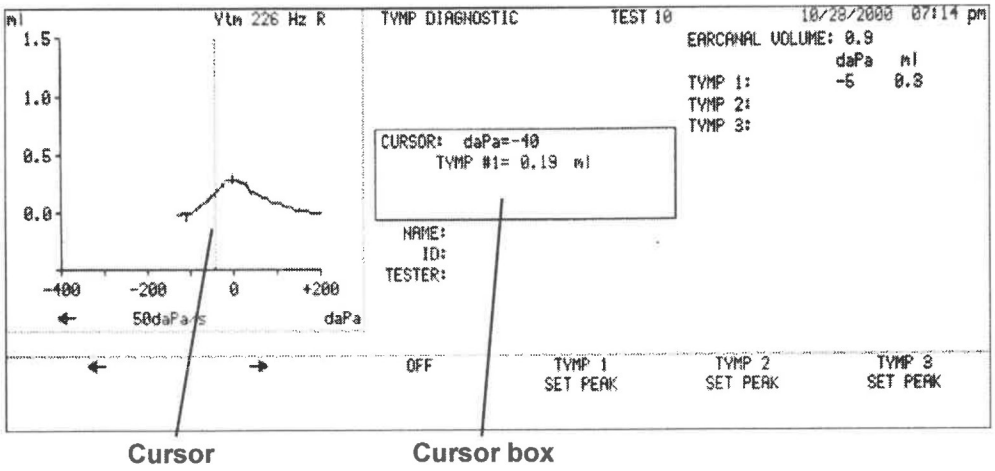
Automatic scaling

Upon completion of a pressure sweep, or if the STOP hardkey is pressed, the compliance scale changes appropriately for the peak measurement. The cursor may be used to call out peak points that are clipped beyond view on the visual display.

Test data stored in memory with appropriate test titles and labels may be recalled by test number. Refer to the descriptions of the PAGE, PRINT, and CLEAR hardkey functions earlier in this chapter.

Cursor

The cursor can be activated to view test results in the PAGE mode by scrolling across the tymp waveform using the left and right scroll arrows.

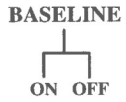


Tymp tests other than Y at 226Hz

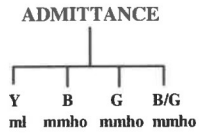
When using the following additional tymp test capabilities:

- Y at 678 Hz or 1000 Hz
- B at 226 Hz, 678 Hz or 1000 Hz
- G at 226 Hz, 678 Hz or 1000 Hz

1) The TympStar automatically sets the BASELINE softkey to OFF when these parameters are selected.



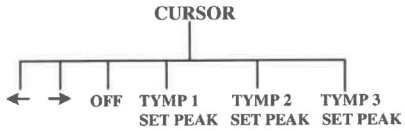
2) Press the B/G softkey to run B and G admittance tracings simultaneously.



NOTE
The G tracing is differentiated by a dotted line.

Cursor and TYMP SET PEAK function

For tymp tests performed with parameters other than Y at 226 Hz, the cursor is used to identify and set peak data points as follows:



1) Press the CURSOR softkey.

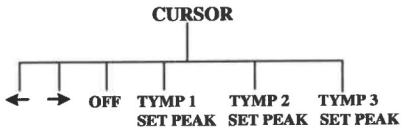
2) Use the left and right cursor arrows to move the cursor across the graphics area. The cursor box displays the numeric position of the cursor on the X and Y axes.

3) Press the TYMP 1 SET PEAK softkey to specify and store selected peak data points for Tymp 1. Use the left and right cursor arrows and SET PEAK

softkeys as above to specify and store selected peak data points for Tymps 2 and 3, if measured.

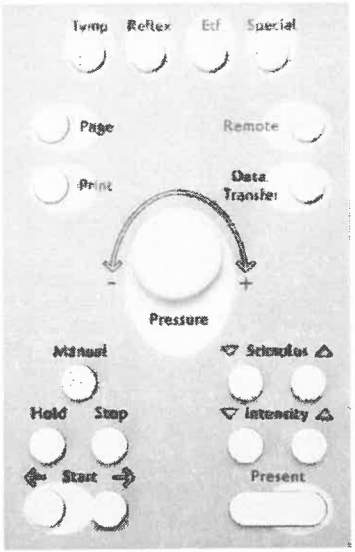
NOTE
If B and G tracings are run simultaneously, the B tracing is Tymp 1.

4) Press the Cursor OFF softkey to remove the cursor data from the LCD screen. Cursor OFF must be selected to return to the previous level of softkeys and resume testing.



Manual tympanometry test procedure

The Manual mode allows the operator to use the Pressure Control Knob to vary the pressure within the ear canal. The operator can also control the speed of the tympanometric test. This feature can be invaluable in testing impatient children or difficult-to-test patients.



1) Press the TYMP hardkey and make sure the probe is securely positioned within the patient's ear canal.

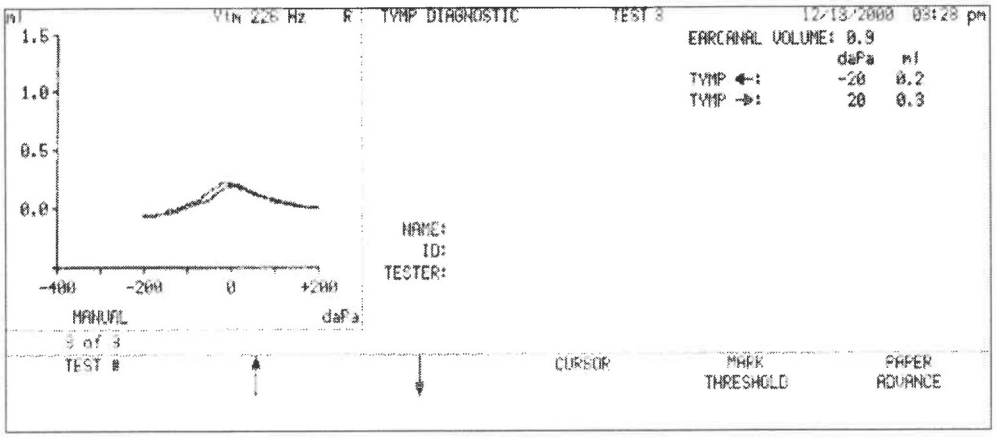
2) Press the EAR softkey and select the right or left ear, then if desired, navigate through the Tymp Diagnostic softkey menu and change parameter settings for the test as required. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

3) Press the MANUAL hardkey to pressurize the ear canal to the previously selected start pressure.

4) Once the start pressure is established, rotate the PRESSURE knob to vary the pressure within the ear canal.

5) View the test results in real-time on the Pressure and Admittance meters as well as on the graph tracing. Multiple tracings can be displayed on the screen.

6) The test summary information is shown at the right of the meters.



One line is dedicated to Tymp peak data collected in the negative direction and a second line is dedicated to Tymp peak data collected in the positive direction. This summary information is updated per line when:

- The Pressure knob is rotated in the opposite direction by at least 50 daPa
- The STOP hardkey is pressed

NOTE

This summary information contains the results of the last two tracings even though multiple tracings in each direction may be displayed on the screen. The last two tracings are stored in memory and can be retrieved using the PAGE hardkey to print results.

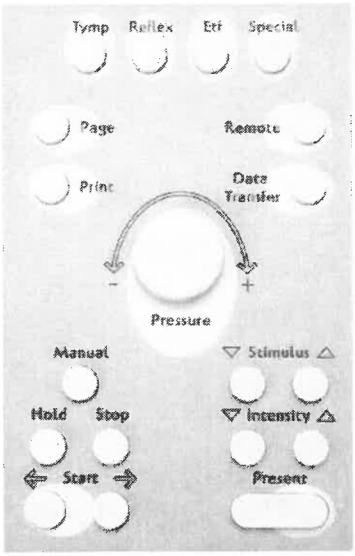
7) The ERASE hardkey can be used at any time prior to pressing the STOP hardkey. Pressing the ERASE hard key causes all tracings on the graph to be removed except for the starting pressure admittance value of the last tracing. This appears as a dot on the screen.

NOTE

NOTE

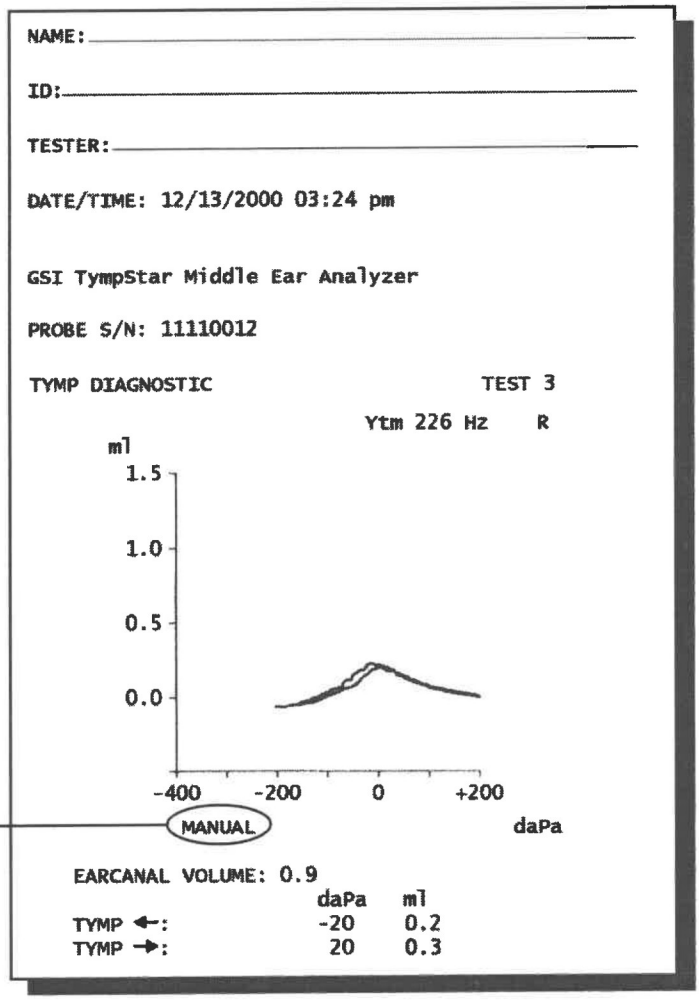
Once the PRESSURE control knob is used following ERASE, this dot is shown as NP/NP on the test summary area. Running two tracings will update this test summary data to tympanometric data.

8) Press the STOP hardkey to store the last two tracings in memory. These results can be printed by pressing the PAGE hardkey to retrieve the results, and then pressing the PRINT hardkey.



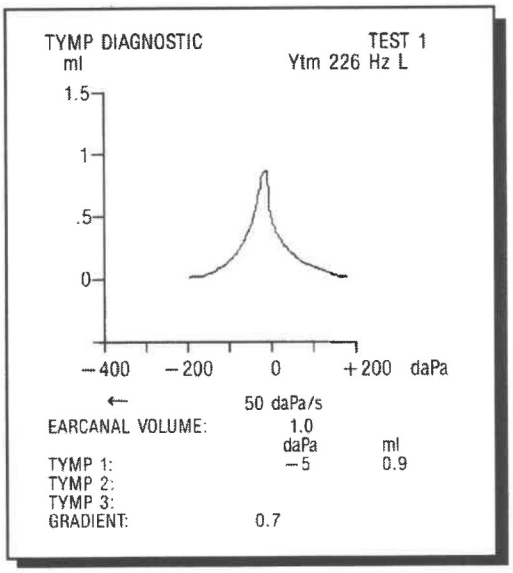
NOTE

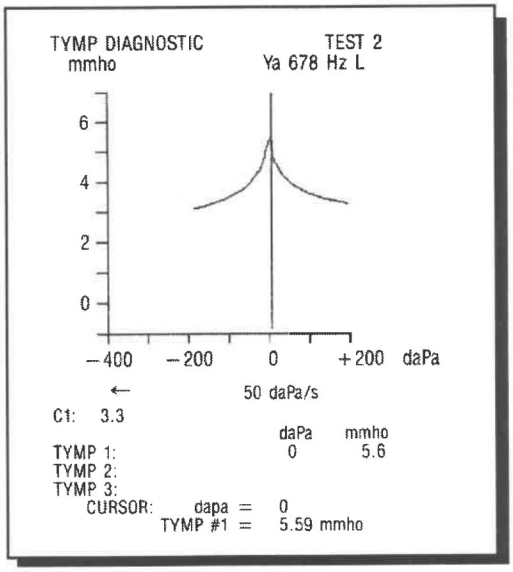
NOTE
The word "MANUAL "will appear on the printout indicating a manual test.

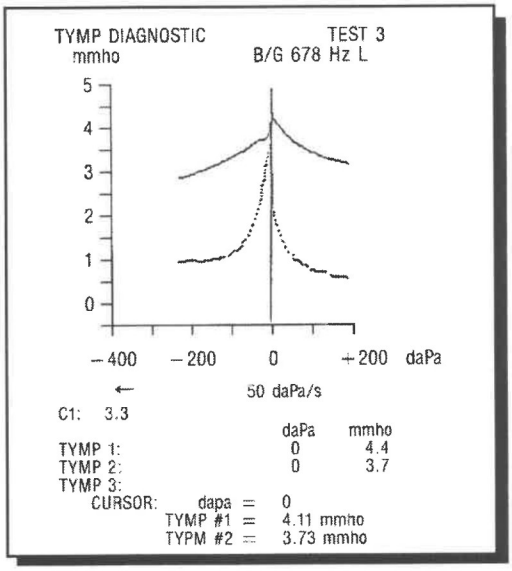


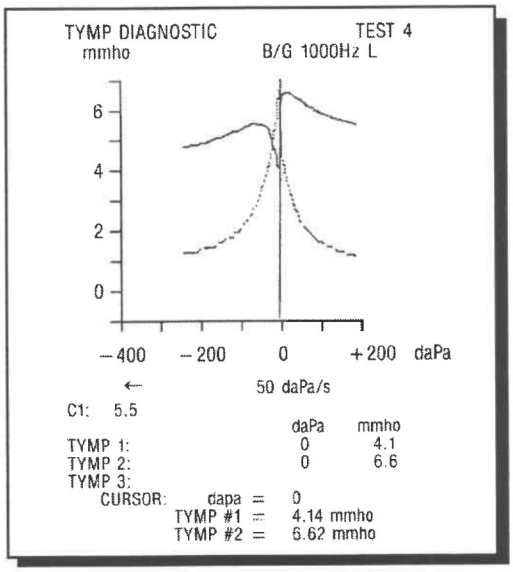
Manual test

Tympanometry printout samples







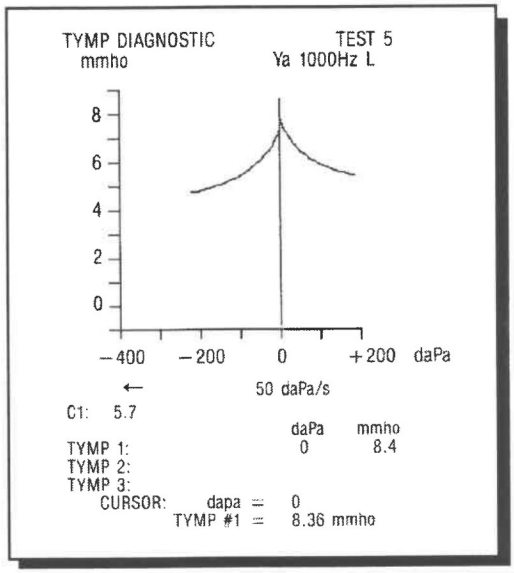


Tympanometry normative values Ytm, 226 Hz

Ear canal volume:
0.2 to 2.0 ml (actual size will vary with age and bone structure)

Compliance peak:
0.2 to 1.8 ml

Pressure peak:
-150 to +100 daPa



Static Admittance Norms (mmho)

Static Admittance Norms (mmho) *

		B	G	
226 Hz	Lower Limit	0.44	0.20	
	Median	0.83	0.37	
	Upper Limit	1.60	0.82	
		B	**G**	**Y**
678 Hz	Lower Limit	0.98	0.75	1.50
	Median	1.53	2.29	2.90
	Upper Limit	2.22	3.94	3.80

* *Margolis, R., and Shanks, J. (Katz, J. 1985)*

Tymp screening with Reflex (Tymp mode)

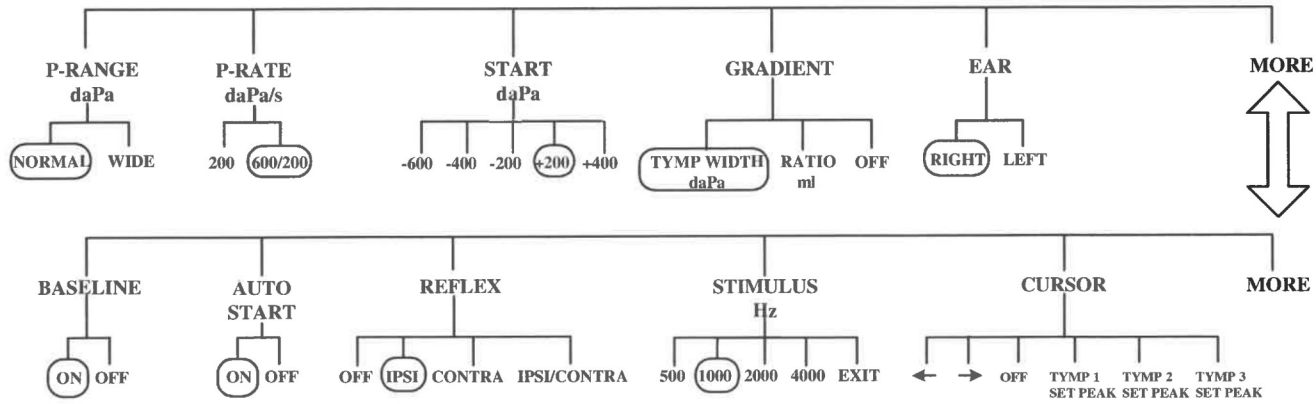
The Screening mode is an automated test mode designed to yield rapid Tymp and Reflex test results. The screening eartips that are provided will comfortably seal the ear by HAND HOLDING the probe against the outer portion of the ear canal. The user may run one tympanogram sweep on a test screen followed by an Ipsi, Contra, or Ipsi/Contra Reflex test if desired. The pressure at which the Reflex test is performed is automatically set to the dynamic compliance peak pressure measured during the Tymp test. If a reflex response (compliance change of .05 ml) is not detected upon the first stimulus presentation, up to two more ascending presentations will follow in an attempt to locate a reflex response. Refer to the table below.

Screening Reflex Test
Intensity Presentations (dB HL) per Frequency

	HL level	Stimulus Frequency 500Hz (dB HL)	1000Hz (dB HL)	2000Hz (dB HL)	4000Hz (dB HL)
Ipsi	1	85	85	85	80
	2	95	95	95	90
	3	105	105	105	100
Contra	1	90	90	90	90
	2	100	100	100	100
	3	110	110	110	110

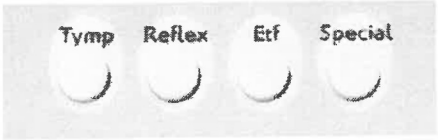
Tymp screening softkey menu structure

Tymp screening includes screening acoustic reflex. The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings

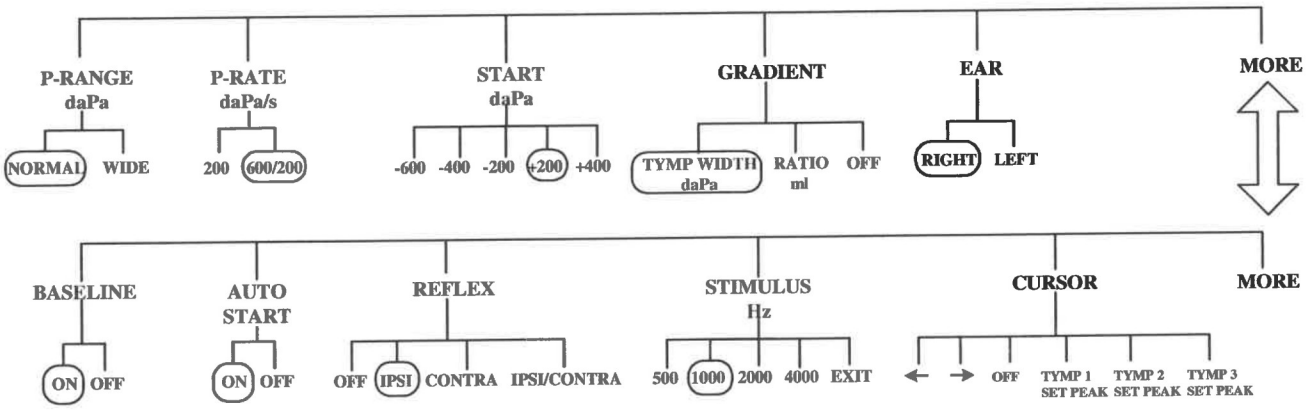


Tymp screening softkey menu structure

1) Select Tymp test mode if necessary by pressing the TYMP hardkey.



2) Press the RETURN hardkey on the LCD panel and the SCREEN softkey to display the Tymp Screening menu shown below.



NOTE

NOTE
Tymp screening is performed at Y, 226 Hz.

3) Place the appropriate size SCREENING eartip on probe tip. The probe box may be positioned on the velcro wristband as a convenience during screening tests.

4) Press the EAR softkey and select the right or left ear, then if desired, navigate through the softkey menus shown above and change parameter settings for the test as required.

5) Holding the probe in your hand, obtain a hermetic seal at the entrance to the ear canal.

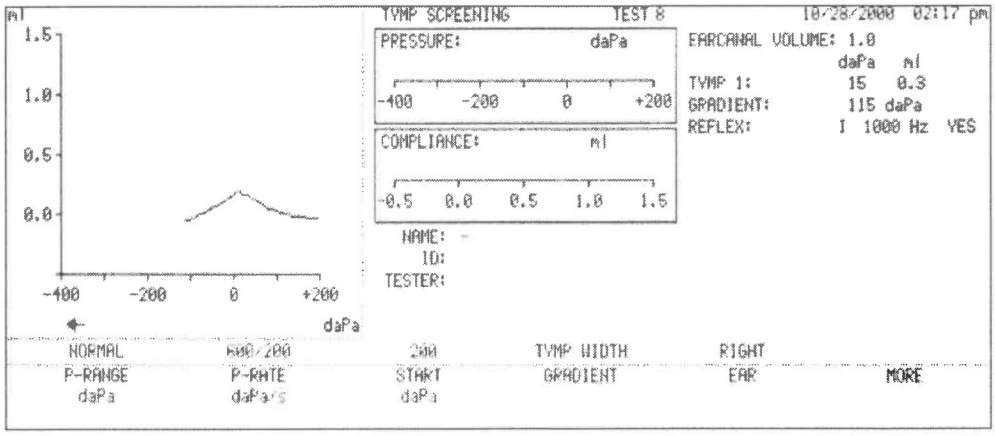
AUTO START ON

The Tymp test will begin as soon as a seal is obtained. The pressure will sweep from the previously selected START daPa Pressure toward ambient pressure, 0 daPa. The pressure sweep will continue only as far as necessary for the tymp to reach its peak point and return to the baseline.

AUTO START OFF

When AUTO START is off, the ← START → hardkeys are used to initiate pressurization and the pressure sweep.

Ear canal volume is measured at the Start-Pressure and is recorded in real time. View the ongoing test results on the graphic display area, and on the Pressure and Compliance Meters.



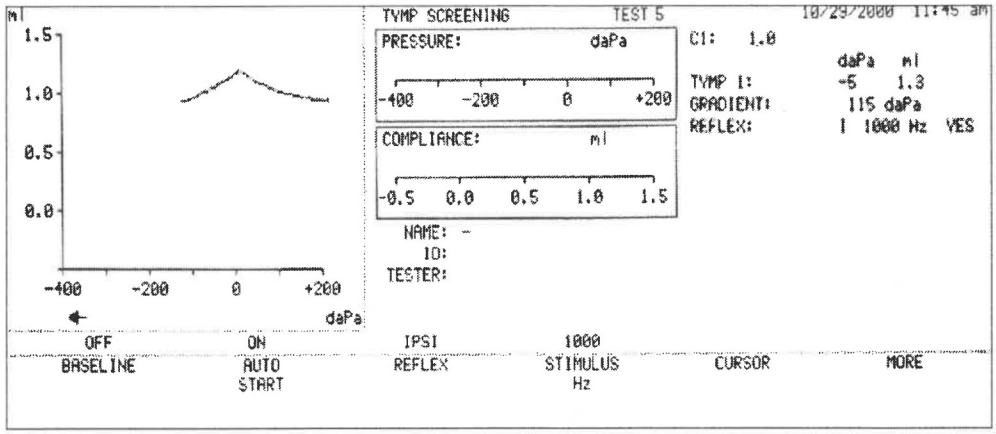
Tymp data is automatically re-scaled upon completion of the test.

BASELINE ON

With BASELINE ON, the compliance value at Start Pressure is labeled EAR CANAL VOLUME. Numeric values for compliance peak (ml), pressure peak (daPa) and gradient appear as summary data at the right of the meter area of the LCD.

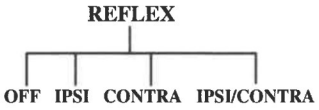
BASELINE OFF

With BASELINE OFF, the compliance value at Start Pressure is labeled as C1.



REFLEX OFF

The screening test concludes at completion of tymp data collection without performing a reflex test.



REFLEX ON

When GSI defaults for the reflex are utilized, the 1000 Hz Ipsi stimulus is automatically presented upon the completion of tymp data collection. Other possible reflex stimuli choices include:

- Ipsi — Up to two frequencies are selectable.
- Contra — Up to two frequencies are selectable.
- Ipsi/Contra — One test frequency is presented to each ear.

Press the STIMULUS Hz softkey to select a test frequency. Press the EXIT softkey following the selection.

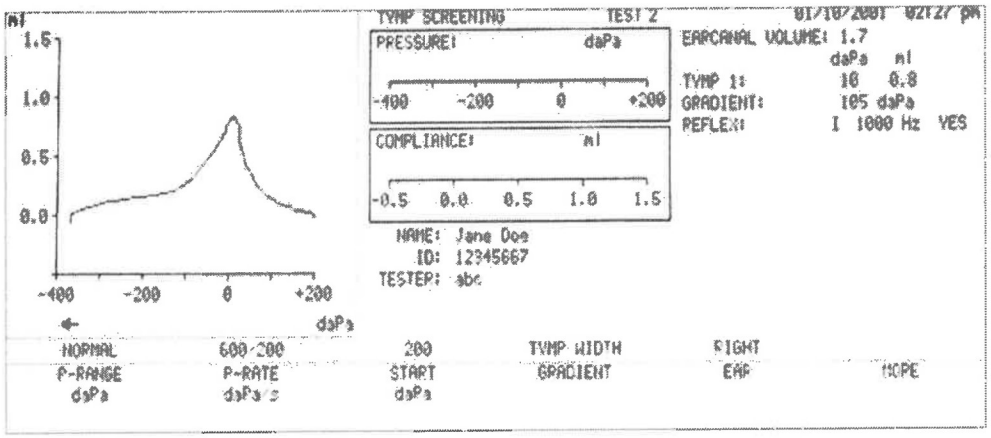
Screening reflex test scoring

The screening reflex test results are scored as follows below the tymp data:

REFLEX: I 1000 Hz YES (If an acoustic reflex was present)

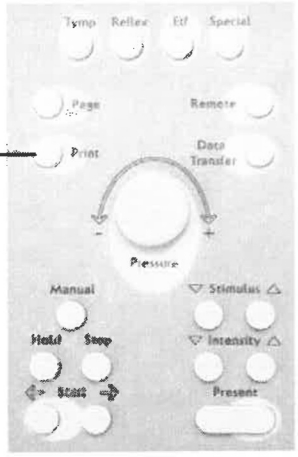
REFLEX: I 2000 Hz NR (If no reflex was measured)

NT is used in place of NR to indicate that the reflex test was aborted (No Test) due to an inability to maintain pressure, or if the STOP hardkey was pressed before reflex testing was completed.



The screening test data is automatically stored at the completion of the test. It can be recalled by pressing the PAGE hardkey, and then printed by pressing the PRINT hardkey. A sample print-out is shown on the next page.

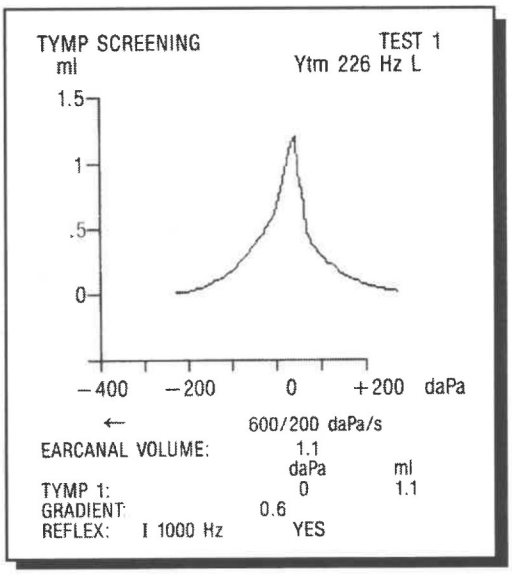
PRINT hardkey



Screening test data can be cleared by pressing the CLEAR hardkey on the LCD panel. Please refer to Erasing and clearing test data earlier in this chapter.

Screening test data can be recalled by PAGING through the test screens. Please refer to Paging test data and the cursor earlier in this chapter.

Tymp screening sample printout



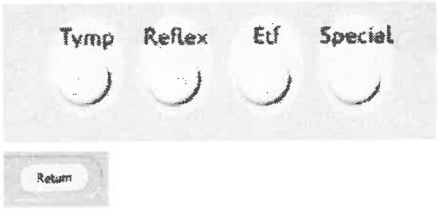
Program mode for tympanometry

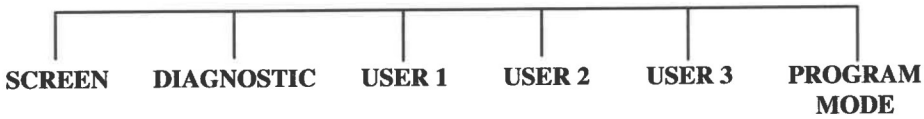
Up to three users may permanently redefine and store, per USER NUMBER, individualized default criteria to fit testing needs. Default test parameters may be reprogrammed for the Tymp Diagnostic or Tymp Screening tests.

Program mode softkey menu structure

The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

Press the TYMP hardkey, then press the RETURN hardkey to display the tymp sub-menu.





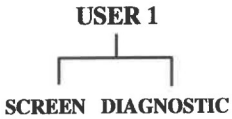
Screen and diagnostic softkeys

Pressing the SCREEN or DIAGNOSTIC softkey provides direct access to screening or diagnostic test functions that use the system defaults. For example, to run screening tests with system defaults, press the SCREEN softkey.

User softkeys

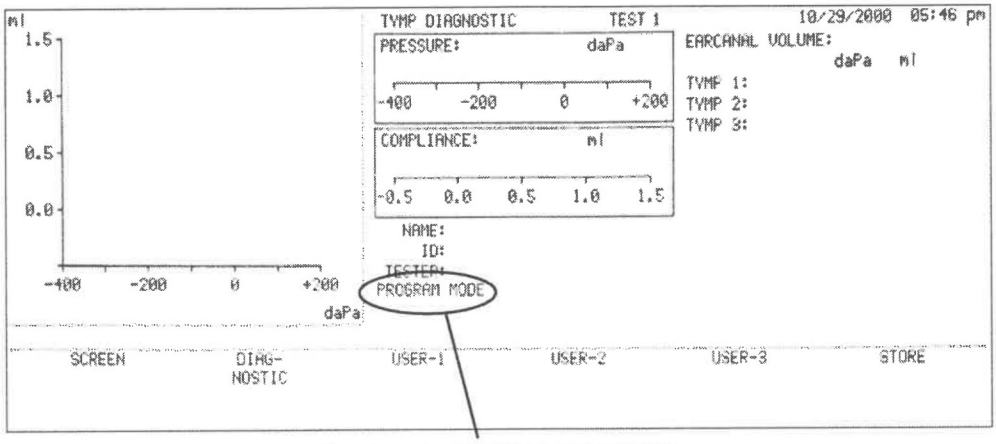
Pressing one of the 3 USER softkeys provides access to test functions with defaults previously programmed by (or for) one of up to three users. For example, to run screening tests or diagnostic tests with defaults programmed earlier by user 1, press the USER 1 softkey.

Each USER softkey can be programmed to provide access to either screening or diagnostic test functions, but not both. For example, the USER 1 softkey might have been programmed to initiate screening but can not initiate diagnostic tests unless it is reprogrammed. Each USER softkey is totally independent of others, and can be programmed to provide either screening or diagnostic functions.



Program Mode

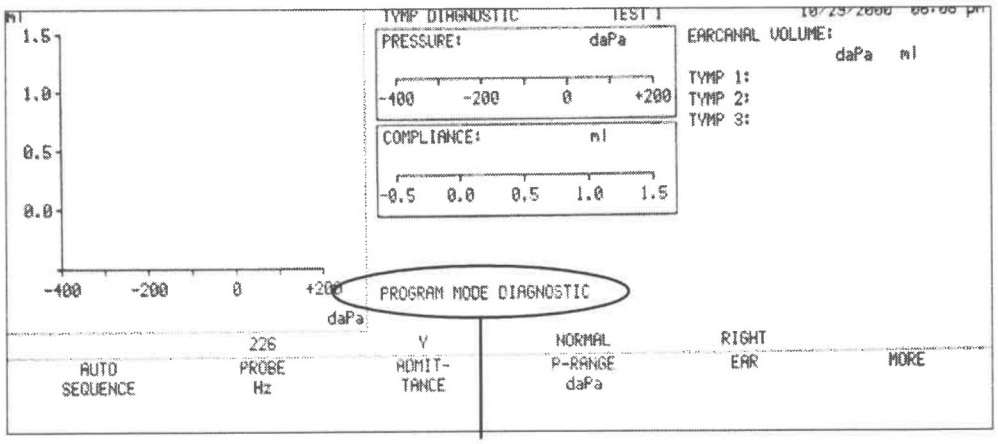
Pressing the PROGRAM MODE softkey places the instrument in the Program Mode and provides access to programming functions for setting overall instrument or user-specific defaults. Tests can not be performed in the Program Mode. Pressing the PROGRAM MODE softkey displays the Program Mode sub-menu and displays the PROGRAM MODE message in the status area of the screen.



System in PROGRAM MODE

Programming default parameters for SCREEN and DIAGNOSTIC modes

Once the system is in the Program Mode, select the test for which defaults will be defined. Pressing the SCREEN or DIAGNOSTIC softkey displays the screening or diagnostic softkey menu across the bottom of the screen with a PROGRAM MODE status message as shown in the example below.



System in PROGRAM MODE

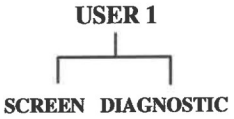
Test parameters can now be selected from the softkey menu to modify their default settings. Once all the test parameters have been selected, pressing the RETURN hardkey returns the display to the PROGRAM MODE sub-menu.

Pressing the STORE softkey stores the selected parameters as defaults for future tests. The STORING DATA status message will be displayed. Press the TYMP (or other test mode) hardkey to return from the Program Mode to the Test Mode with the new test parameter defaults.

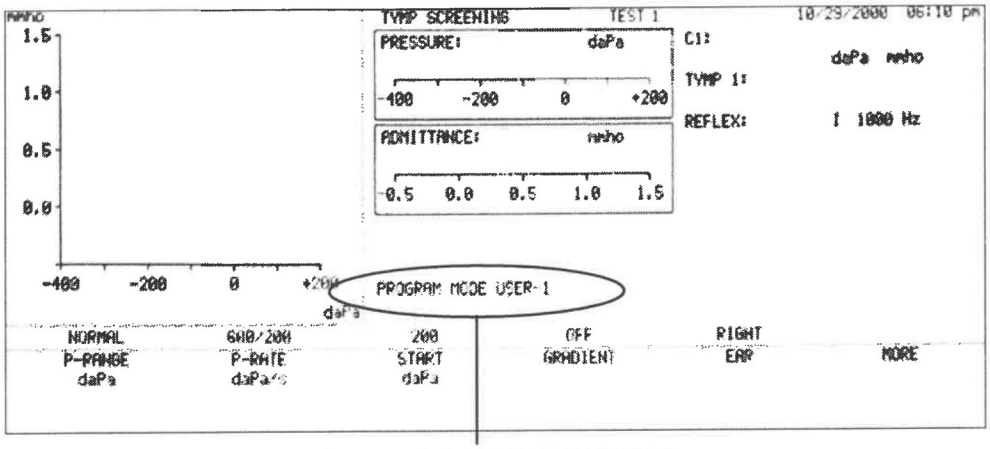
Programming default parameters for user tests

When the system is in the Program Mode, select the USER softkey for which default screening or diagnostic test parameters will be defined.

Press the USER 1, USER 2 or USER 3 softkey to program individualized test parameters that will only be defaults for the specified user. Select the USER NUMBER softkey followed by SCREEN or DIAGNOSTIC. A user sub-menu will be displayed.

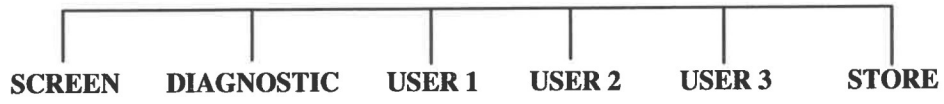


Pressing the SCREEN or DIAGNOSTIC softkey displays the screening or diagnostic softkey menu across the bottom of the screen with a PROGRAM MODE status message as shown in the example below.



System in PROGRAM MODE

Test parameters can now be selected from the softkey menu to modify their default settings. Once all the test parameters have been selected, pressing the RETURN hardkey returns the display to the PROGRAM MODE sub-menu.



Pressing the STORE softkey stores the selected parameters as defaults for future screening or diagnostic tests performed by that user. The STORING DATA status message will be displayed. Press the TYMP (or other test mode) hardkey to return from the Program Mode to the Test Mode with the new test parameter defaults.

Acoustic Reflex testing

The acoustic reflex consists of a response by one or more middle-ear muscles to suprathreshold acoustic stimulation of the auditory pathway. To elicit an acoustic reflex, an acoustic stimulus (pure-tone, noise, or click) is presented to the ear canal by a probe or earphone. A portion of this stimulus is carried by the ossicular chain to the cochlea. From the cochlea, the 8th nerve carries the information to the brain stem where a determination is made as to whether the stimulus is sufficiently intense to elicit a response. When a response is elicited, the 7th nerve carries the command to the stapedius muscle to contract. Contraction of this muscle and/or the tensor tympani stiffens the eardrum and the ossicular chain; thereby, decreasing the ease with which sound enters the auditory pathway. Thus, the end result of an acoustic reflex is a slight decrease in the ability of the eardrum and the ossicular chain to conduct acoustic energy to the cochlea.

Since the acoustic reflex causes a relatively small decrease in mobility (0.02 ml or greater using a probe tone of 226 Hz) within the middle ear system, it is important to conduct this test at a pressure level where the greatest response occurs. Therefore, acoustic reflex threshold and decay measurements are generally carried out at the pressure value where peak mobility occurred during a tympanogram. If no peak is observed, the acoustic reflex tests are performed at atmospheric pressure (0 daPa).

Acoustic reflex measurements can be obtained Ipsilaterally or Contralaterally. For Ipsilateral testing, the stimulus is presented to the same ear where the measurements are made. For Contralateral testing, the measurements are made with the probe in one ear while the stimulus is presented to the opposite ear through an earphone or insert phone.

NOTE

NOTE

Refer to <u>Appendix A: Specifications</u> for the following information:

- **Method used for transfer of reference equivalent threshold values.**
- **Reference equivalent hearing threshold levels, in dB SPL.**
- **Transfer data of Ipsi and Contra phones.**
- **Compensations in SPL for volumes below 1.2 ml.**

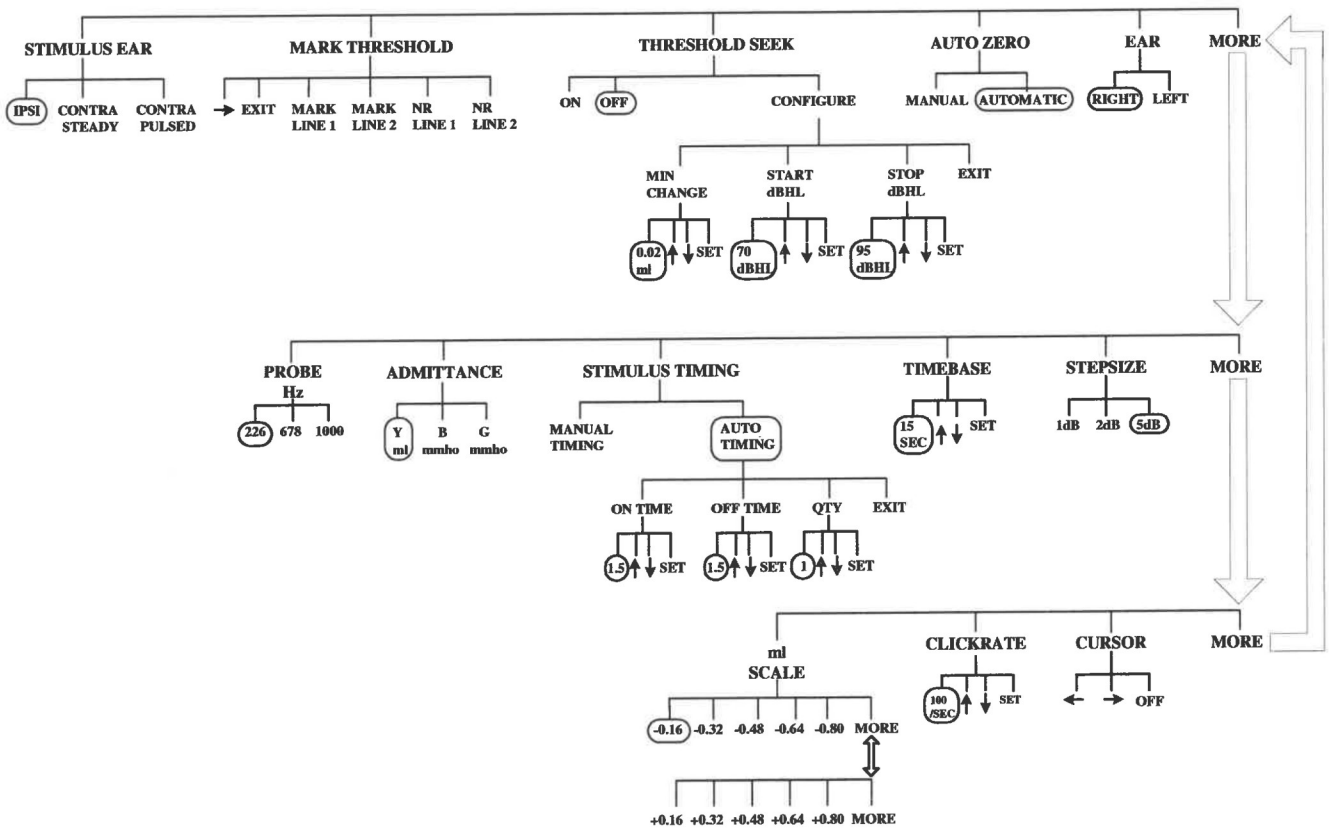
Non-acoustic Reflex testing

Studies have shown that it is possible to activate the middle-ear muscles bilaterally by sound as well as by non-acoustic stimulation.* It is not always possible to obtain acoustic reflex measurements (e.g., in cases of severe to profound hearing loss). The ability to elicit a reflex independent of the hearing level in the stimulated ear permits the examination of 7th nerve integrity and ossicular continuity up to the point of insertion of the stapedius muscle even in deaf people. Studies indicate that the response is greater if the Ipsilateral ear is stimulated.

One non-acoustic reflex test consists of mechanical stimulation of the external ear with a cotton swab. Other test procedures consist of blowing air toward the eyes with a Politzer balloon or of lifting the upper eyelids simultaneously so as to elicit the startle response.

Reflex Threshold softkey menu structure

The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.



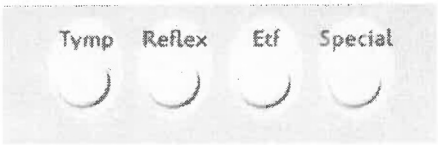
Reflex diagnostic softkey menu structure

* Djupesiand, Gisle. "Non-acoustic Reflex Measurement - Procedures, Interpretations, and Variables." Acoustic Impedance and Admittance - The Measurement of Middle Ear Function, A. Feldman and L. Wilber, eds. Williams and Wilkins, 1976.

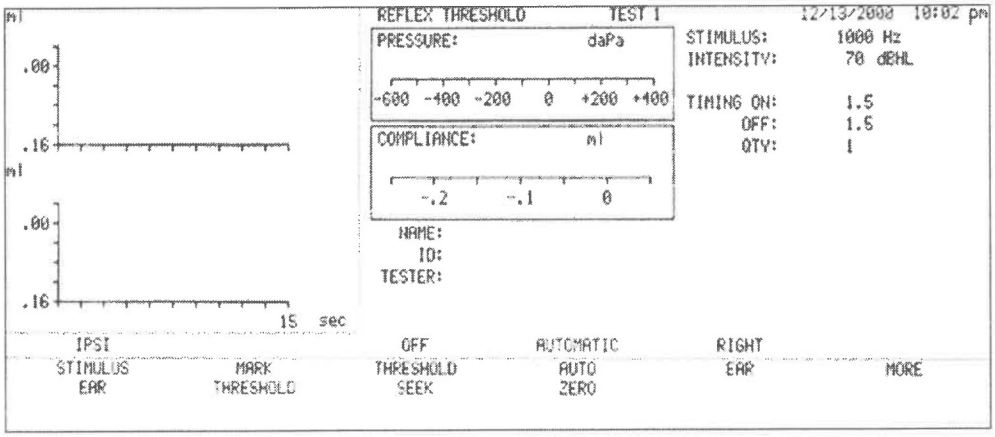
Reflex Threshold automatic test procedure

Ipsi time-multiplexed stimuli are delivered to the ear canal via the probe insert. Contralateral steady or pulsed stimuli are delivered to the ear canal via the Contra insert phone fitted with an appropriate size standard eartip.

1) Press the REFLEX hardkey to select the Reflex Diagnostic test mode.



2) Default test parameters are displayed above the softkeys across the bottom of the LCD screen.



3) Press the EAR softkey and select the right or left ear, then if desired, navigate through the Reflex Diagnostic softkey menu and change parameter settings for the test as required. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

   Threshold testing may be performed with probe tone frequencies of 226 Hz, 678 Hz, and 1000 Hz. Admittance settings "Y", "B", and "G" may be selected.

NOTE

Reflex responses may be inverted, or deflected in an upward direction when using higher probe tones. The direction of the response may also differ when testing with "Y", "B", or "G" components.

Three special features are available in Reflex Threshold. They are:

- Auto Timing
- Mark Threshold
- Threshold Seek.

Stimulus Timing

Auto Timing provides the ability to preset the stimulus timing for reflex threshold testing. This timing sequence includes the ON TIME for the stimulus presentation and the OFF TIME for measuring the recovery after the stimulus

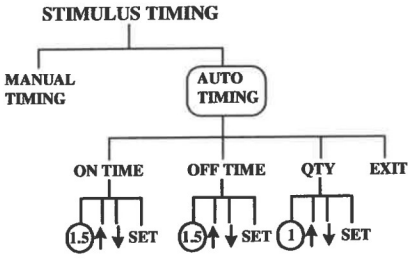
is turned off. When Auto Timing is selected, press and release the PRESENT hardkey to activate the Auto Timing sequence.

NOTE
The programmed Auto Timing parameters are also used during Threshold Seek and Auto Sequence.

Auto timing of stimuli

The GSI Default ON TIME is 1.5 seconds, and the GSI Default OFF TIME is 1.5 seconds. The GSI default quantity (QTY) of presentations is 1.

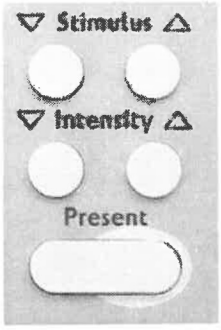
4) Change the ON TIME, OFF TIME or Quantity of stimulus presentations if necessary by navigating to the desired sub-menu and using the arrow and SET softkeys. Any of these changes will be temporary, and the default values will be used the next time that the REFLEX test mode is initiated. Use the Program Mode to change these parameters permanently.



5) Press the EXIT softkey to return to the Reflex Threshold menu.

Minimum and maximum timing allowable for reflex threshold

6) Press the PRESENT hardkey momentarily to present the stimuli for the length of time set above.

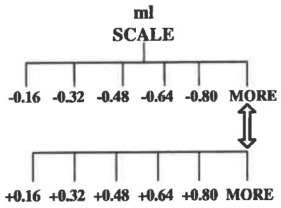


	Timebase			
Time in Seconds	15.00	30.00	45.00	60.00
Prestimulus Time	1.50	3.00	4.50	6.00
Inter Trace Time	0.25	0.25	0.75	0.75
Minimum On Time	1.00	1.00	2.00	2.00
Maximum On Time	13.50	27.00	40.00	54.00
On Time Increment	0.50	0.50	2.00	2.00
Off Time Increment	0.50	0.50	2.00	2.00

Manual timing of stimuli

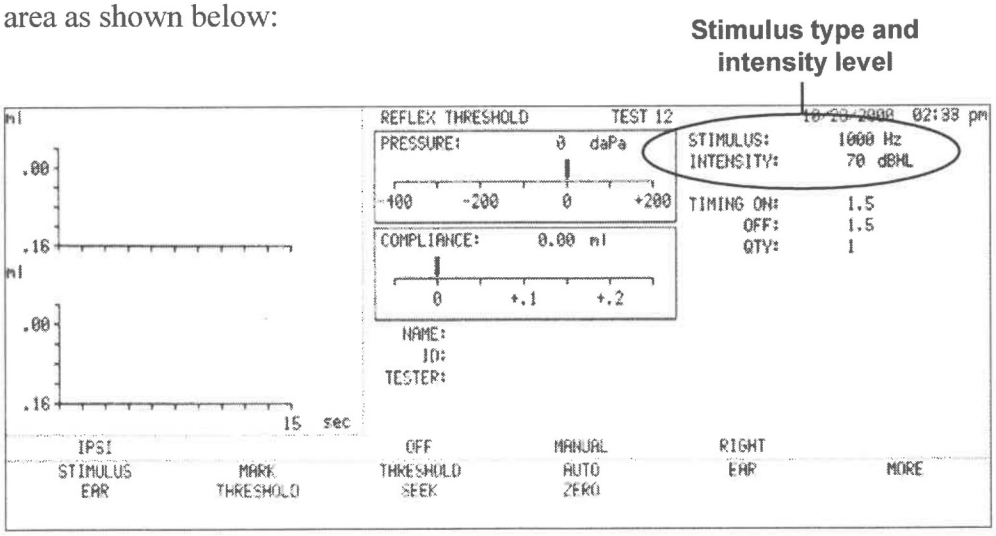
The manual timing feature allows the stimulus to be presented for the length of time the PRESENT hardkey is pressed. Upon release of the PRESENT hardkey, the tracing continues on the screen for 1.5 seconds to allow visualization of recovery.

7) Press the ml SCALE softkey to select the sensitivity for the display of test results. Press the MORE softkey to select positive scales for the display of reflex tracings deflected upward.

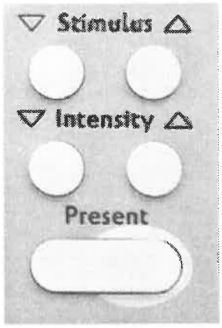


NOTE
Reflex responses are often positive when testing with 678 Hz or 1000 Hz probe tones.

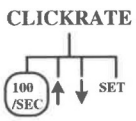
The stimulus type and intensity level are displayed at the right of the meter area as shown below:



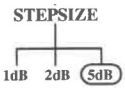
8) Scroll through available stimuli by pressing the STIMULUS hardkey. Selection of Non-Acoustic is also made in this manner. The STIMULUS hardkey can be held down continuously for rapid scrolling and wrap around.



9) When CLICK is selected as the stimulus, the click rate default of 100 clicks/sec can be changed temporarily by pressing the CLICK RATE softkey, changing the rate using the arrows and pressing SET. Use the Programming Mode to change the click rate permanently.



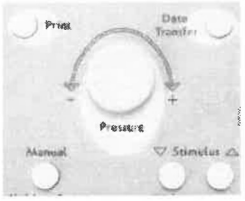
10) Press the INTENSITY hardkey to select the intensity level (dBHL) for stimulus presentations. Use the STEP SIZE softkey to select 1, 2 or 5 dB steps. (Clicks are calibrated in peak equivalent dB SPL.)



NOTE
The display of Intensity contains an asterisk (*) if non-GSI calibration data is used.

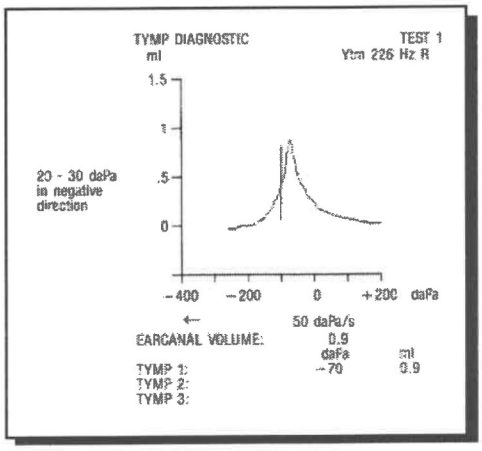
11) With probe insert securely fitted in the ear canal press the ◄— START —► hardkey. The ear will be pressurized to dynamic admittance peak pressure as recorded by the last tymp run, or to 0 daPa if previous tymp data is unavailable.

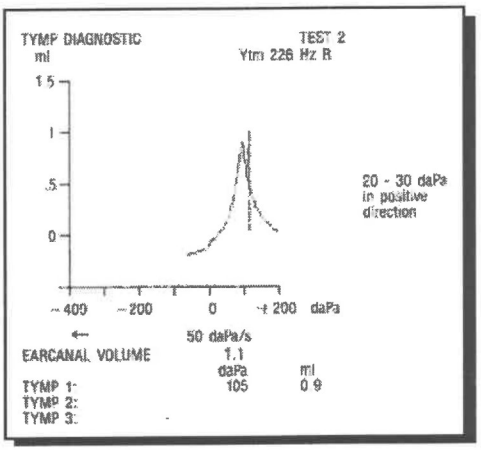
The Pressure Knob is active for fine tuning pressure between stimulus presentations for all reflex type tests.



NOTE
For testing patients exhibiting hyperflaccid or sharply sloped tymps, it is helpful to OFFSET THE PRESSURE in reflex threshold tests. This removes the fluctuations seen on the Admittance meter between stimulus presentations.

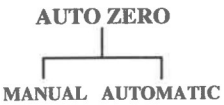
Offset the pressure 20-30 daPa in the same direction as the pressure peak as shown below:

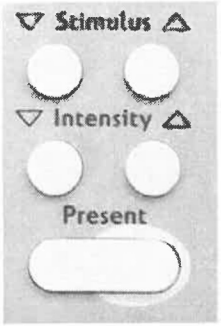




Auto Zero

12) Admittance can be automatically zeroed each time the PRESENT hardkey is pressed to maintain a constant baseline. To activate this feature, press the AUTO ZERO softkey and then press AUTOMATIC before selecting START. Press AUTO ZERO after START to manually AUTO ZERO the meter.





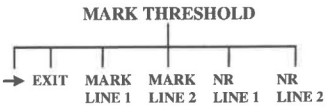
13) Press PRESENT hardkey. A brief prestimulus baseline is drawn. The stimulus is presented for the time specified by STIMULUS TIMING parameters in AUTO Timing, or for as long as the PRESENT hard key is pressed in MANUAL timing.

14) The intensity of the reflex-activating signal is labeled above the initial baseline of the reflex tracing. The amplitude of the response is labeled below the intensity.

NOTE
The following are criteria for reflex responses:
226 Hz: A repeatable compliance change of .02 ml or greater
678 Hz: Arepeatable admittance change of .06 mmhos or greater
1000 Hz: Arepeatable admittance change of .09 mmhos or greater

Mark Threshold

Often multiple tracings are obtained per stimulus presentation, but only one represents the reflex threshold. Mark Threshold allows the operator to scroll across each line of data and select the intensity values determined to be the threshold.



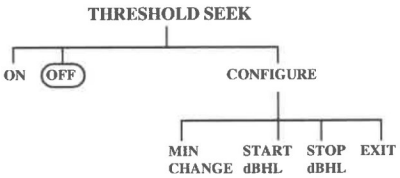
Press the MARK THRESHOLD softkey. Use the arrow key to move from the top left to the bottom right tracing. Press theMARK LINE 1 softkey when the cursor line is at the desired threshold value for Line 1. An Asterisk will appear next to this tracing. Continue to press the right arrow key to move to the desired threshold value for Line 2. An asterisk will appear next to this tracing. Press the EXIT softkey when finished. Use NR LINE 1 or NR LINE 2 when no reflex threshold is measurable.

NOTE

NOTE
Mark Threshold is available during testing once data appears on the display. It is also available in the PAGE mode. It is possible to modify the Mark Threshold selection at any time.

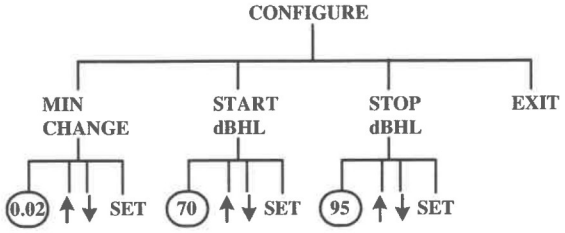
Threshold Seek

Threshold Seek automates the sequence of button presses used to arrive at reflex threshold values and also automates the marking of reflex threshold values. To configure this function, it is necessary to set the intensity range for the stimulus presentation.

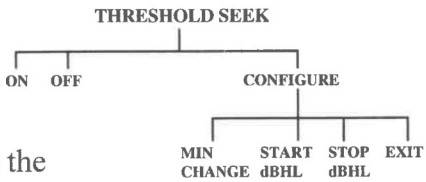


This includes the START dBHL and the STOP dBHL. The Minimum Change parameter is used to determine how to Mark the threshold value. The factory default settings are:

Minimum Change = 0.02
START dBHL = 70 dBHL
STOP dBHL = 95 dBHL

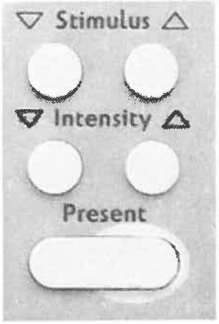


15) Press the THRESHOLD SEEK softkey to activate automatic threshold detection and marking. When THRESHOLD SEEK is on, an amplitude change equal to or greater than the MIN CHANGE value is automatically marked on the tracing as the threshold value. Pressing the MIN CHANGE softkey displays up/down arrows for setting the minimum change to mark a threshold. This value can be set in the range from 0.02 to 0.8.

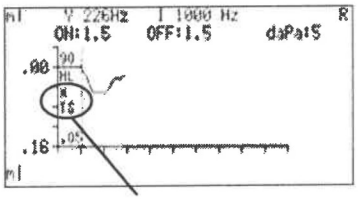


NOTE
Threshold Seek should only be used with quiet, cooperative patients.

16) Use the STIMULUS hardkeys to select the desired activating stimulus, then press and release the PRESENT hardkey. Auto Timing controls the stimulus presentation timing for each intensity level.



17) The reflex graph will display the response to the selected stimulus at 70 dBHL. If the compliance change is measured as 0.02 or greater, the stimulus presentation is presented at the same level a second time to ensure that a repeatable response is acquired. If it is, the stimulus presentation sequence will stop and the display will contain the tracing as well as an asterisk and the letters TS. The asterisk indicates reflex threshold and the letters TS indicate that the threshold was determined with the Threshold Seek protocol.



Asterisk and TS indicator

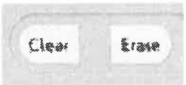
18) If the measured compliance change is less than the programmed MIN CHANGE, the intensity will be automatically incremented by 5 dB and the stimulus will be presented at 75 dBHL. Once again the response will be displayed and automatically evaluated against the MIN CHANGE criterion. If it is met, the same intensity will be presented a second time as a check for repeatability.

NOTE
The stimulus intensity is automatically incremented in 5 dB steps (or in 1 dB or 2 dB steps if selected) up to the STOP dB HL only if a repeatable response is not measured at the lower intensity level.

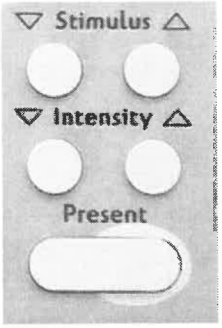
CAUTION
Care should be taken when programming the STOP dB HL parameters to avoid exposure to high intensity levels.

NOTE
The MIN change value should be set appropriately for the probe tone frequency used.

19) Erase sub-threshold tracings on a reflex line in reverse sequence by pressing the ERASE hardkey on the LCD panel prior to pressing the CONTINUE softkey. Pressing the CONTINUE softkey places data on a line in memory.



20) The intensity level may be changed between stimulus presentations without using the Threshold Seek feature by pressing the appropriate INTENSITY hard key.



WARNING!

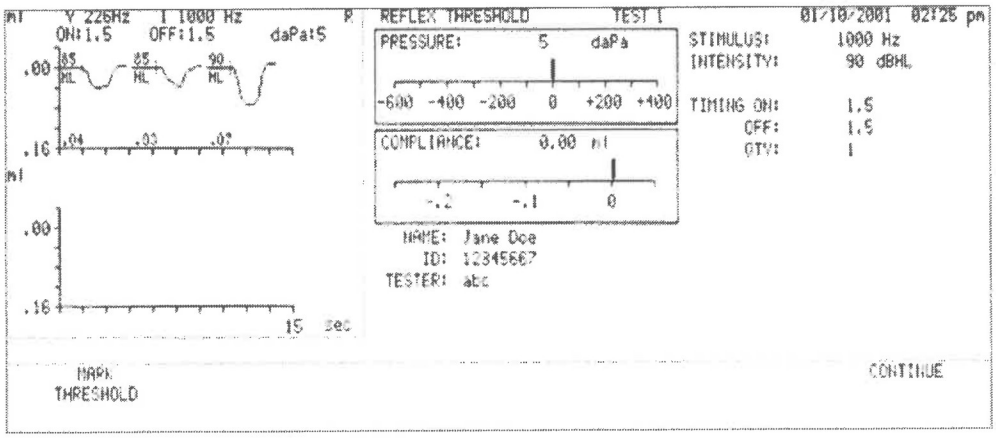
WARNING

The time period of exposure to intensity levels above 100 dB HL should be kept to a minimum. Selecting an intensity above 100 dB HL results in the alert message "High intensity selected" to appear. Extreme care should be used in presenting stimuli at high intensity levels during acoustic reflex measurements.

21) Press the CONTINUE softkey at the end of a line of tracings to resume tracings on the next line or next page.

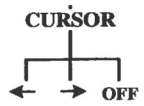
NOTE

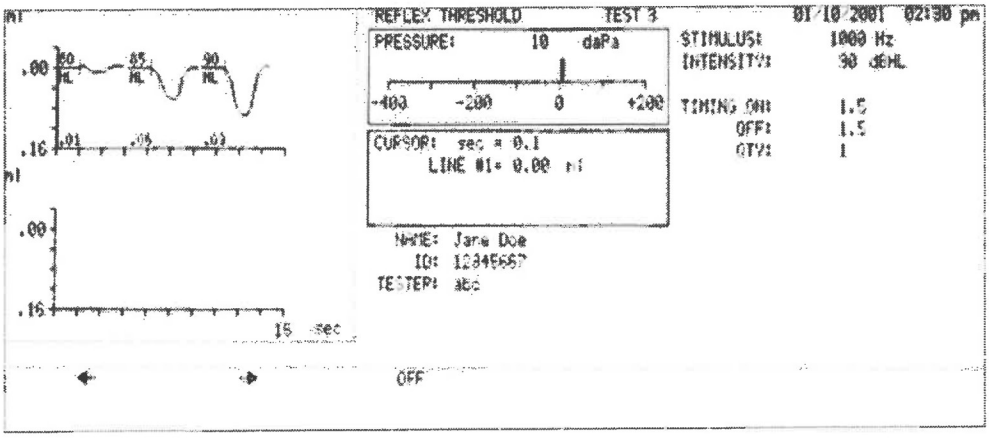
The MARK THRESHOLD softkey is also available prior to selecting CONTINUE. This allows the operator to set the threshold value per line.



22) If STIMULUS EAR, TIMING, or STIMULUS settings are changed during a reflex test, a new line of tracings is generated. Each line is appropriately labeled and indicates the pressure of the last reflex presentation.

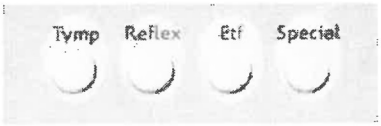
23) The CURSOR softkeys may be used after the test to call out numeric points on Line 1 and Line 2 of the graphics area.





24) Changing the test EAR or TIMEBASE settings causes a new test page to be selected. The previous test page is automatically stored in memory.

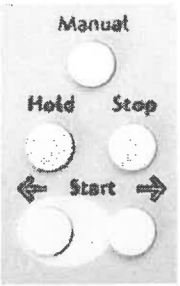
25) Initiate Reflex Decay testing by pressing the SPECIAL hardkey, or terminate the thresh old test by pressing the STOP hardkey.



NOTE

NOTE

Pressure from the last reflex threshold presentation is retained and automatically set when any other Reflex type test mode is selected. If the STOP hardkey has been depressed in a Reflex test mode, the START hardkey must be pressed to repressurize the ear canal to the peak value.

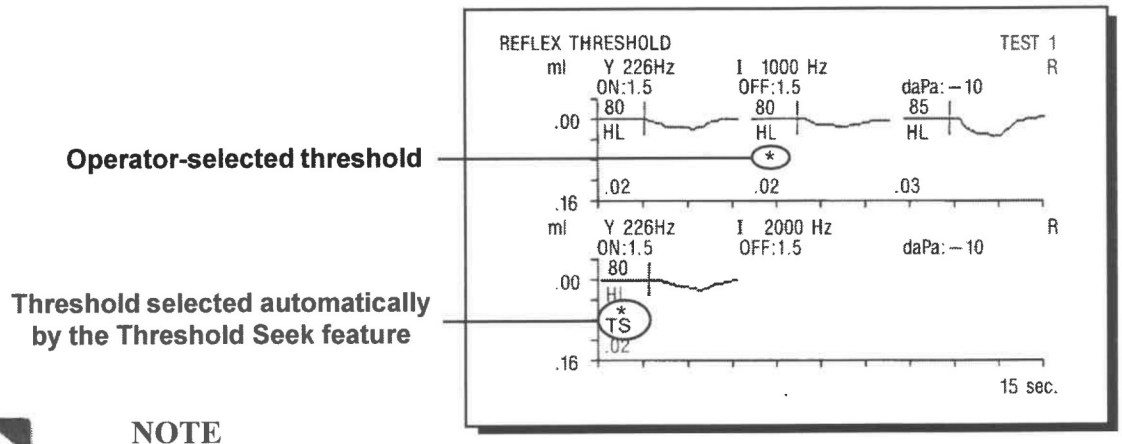


26) Test data can be erased or cleared using the ERASE or CLEAR hardkey on the LCD panel. Please refer to Erasing and clearing test data earlier in this chapter.

27) Test data can be recalled by PAGING through the test screens. Please refer to Paging test data and the cursor earlier in this chapter.

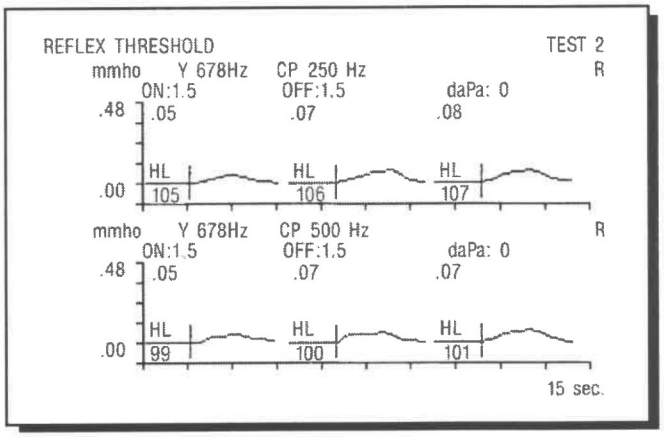
Reflex Threshold sample printouts

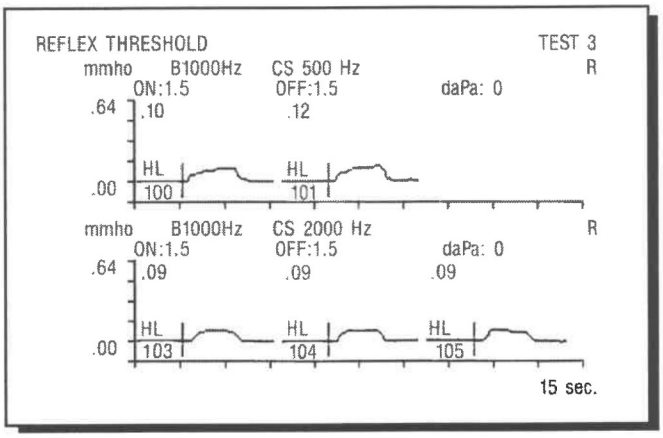
28) The test data is automatically stored at the completion of the test and may be printed by selecting the PAGE hardkey followed by the PRINT hardkey.



NOTE

An asterisk indicates an operator-selected reflex threshold value. An asterisk accompanied by the letters "TS" indicate a reflex threshold value selected automatically by the Threshold Seek feature.



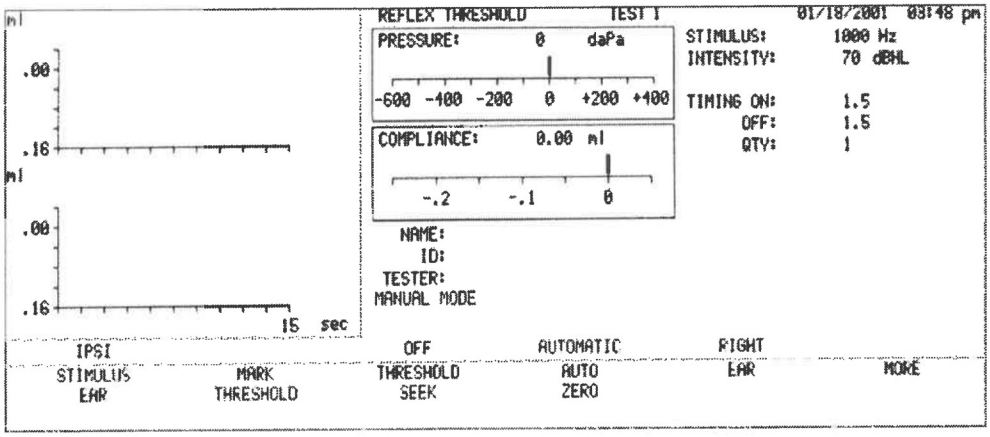


Reflex Threshold MANUAL test procedure

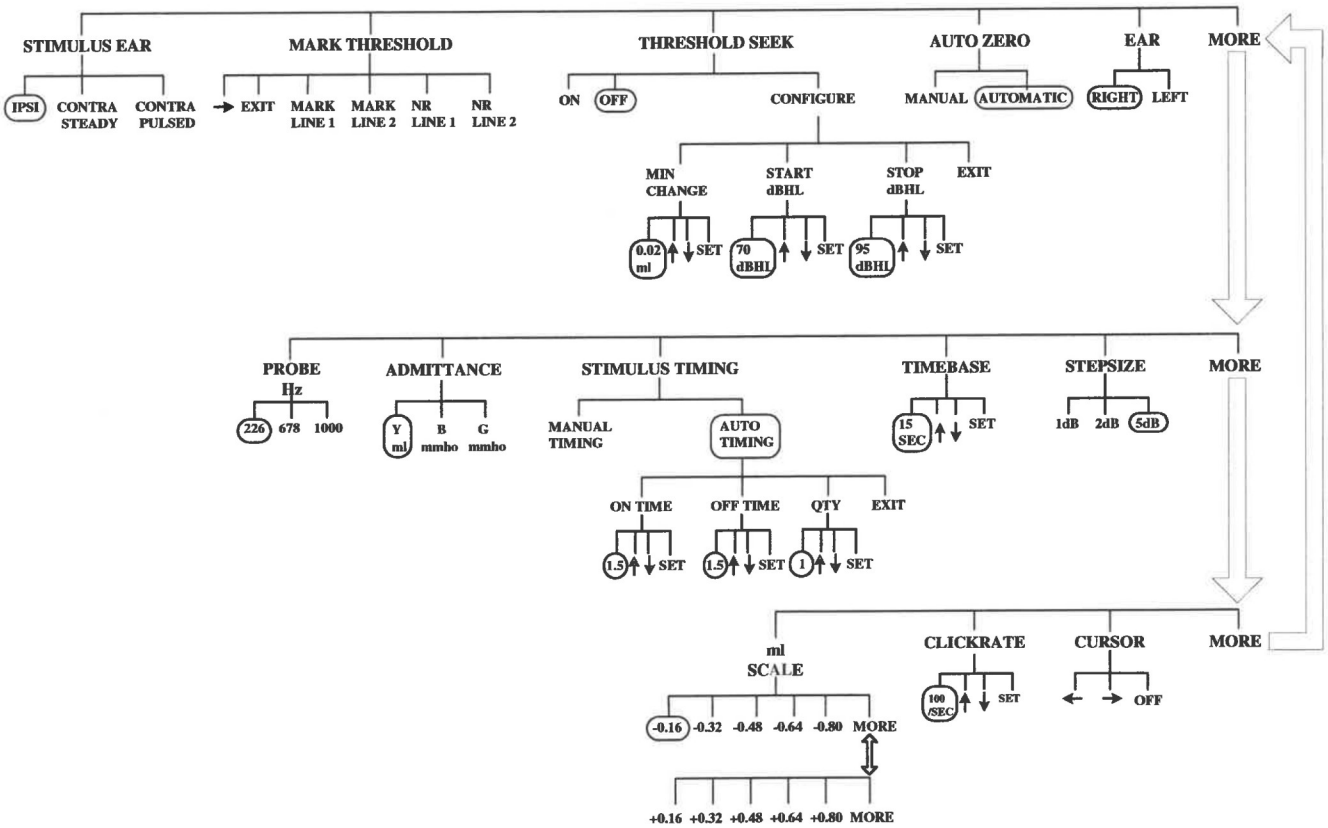
Manual reflex testing is useful when a quick reflex test is preferred, or when an approximate starting intensity level for threshold testing is desired.

1) Press the REFLEX hardkey to select the Reflex Diagnostic test mode.

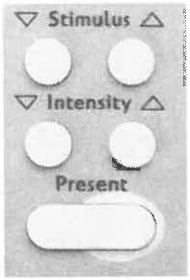
2) Default test parameters are displayed above the softkeys across the bottom of the LCD screen.



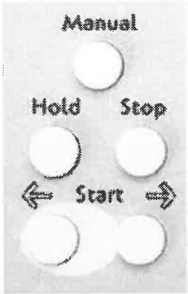
3) Press the EAR softkey to toggle between the right and left ear, then if desired, navigate through the Reflex Diagnostic softkey menu and change parameter settings for the test as required. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.



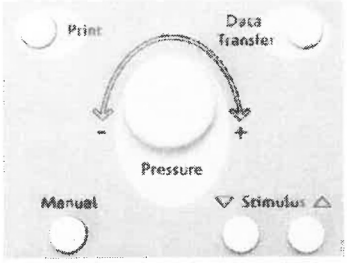
4) Select the test stimulus by depressing the STIMULUS hardkey. Select the desired intensity by depressing the INTENSITY hardkey.



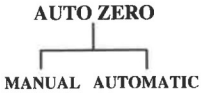
5) Press MANUAL hardkey to pressurize the ear canal to dynamic admittance peak pressure, or to 0 daPa if the previous tymp data is unavailable.



6) Fine tune the pressure if necessary by rotating the PRESSURE knob.



7) Use the AUTO ZERO softkey (if necessary) to ensure zeroing of admittance meter prior to presenting the stimulus. Admittance can be automatically zeroed each time the PRESENT hardkey is pressed to maintain a constant baseline, by setting the AUTO ZERO softkey to AUTOMATIC.



8) Depress PRESENT hardkey. View the Admittance Meter for a detectable admittance change:
226 Hz: 0.02 ml or greater
678 Hz: 0.06 mmho or greater
1000 Hz: 0.09 mmho or greater

The intensity level may be changed between stimulus presentations.

Reflex Threshold summary

Reflex threshold manual mode:
Results are viewed on the admittance meter only and no printout is available. Manual or automatic timing can be used.

Reflex threshold automatic (START key) mode:
Results are displayed in real-time on the admittance meter and graph. The stimulus timing may be set to:

- Manual timing:
  Pressing and holding the PRESENT hardkey determines how long the stimulus is ON.
- Automatic timing:
  A momentary press of the PRESENT hardkey causes the preset ON/OFF times to be utilized.

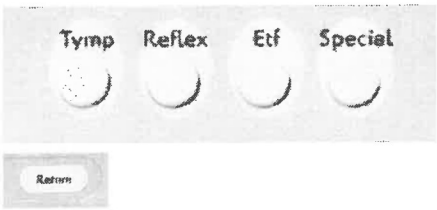
Program mode for Reflex Threshold

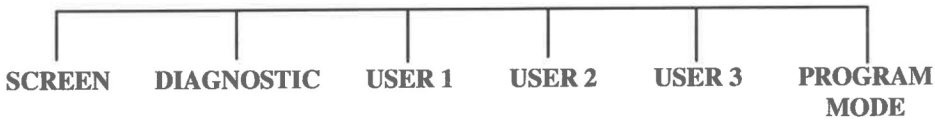
Up to four users may permanently redefine and store, per USER NUMBER, individualized default criteria to fit Reflex Diagnostic testing needs. Default test parameters may also be programmed for the main Reflex Threshold hard-key called Diagnostic.

Softkey menu structure

The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

Press the REFLEX hardkey, then press the RETURN hardkey to display the reflex sub-menu.





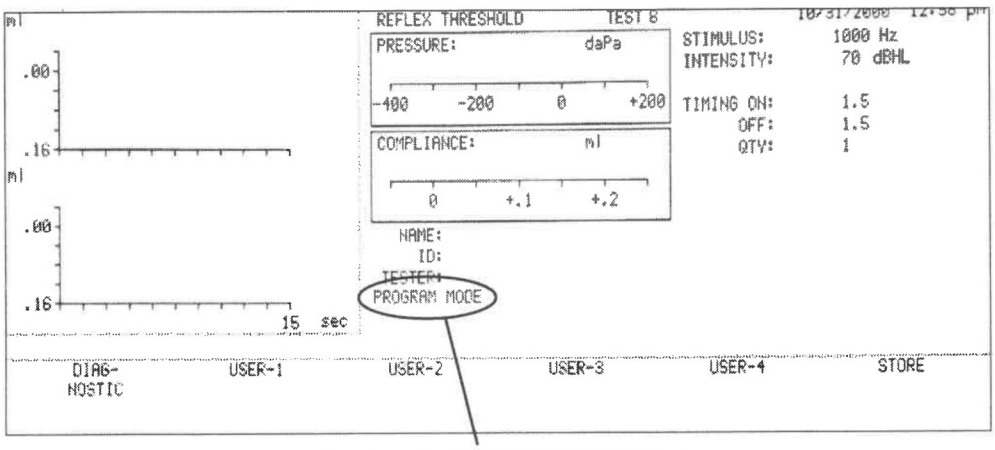
Pressing the DIAGNOSTIC softkey provides direct access to diagnostic test functions that use the current system defaults. Most often this test mode is entered directly by pressing the REFLEX hardkey.

Pressing one of the 4 USER softkeys provides access to test functions with defaults previously programmed by (or for) one of up to four users. For example, to run diagnostic tests with defaults programmed earlier by user 1, press the USER 1 softkey.

Each USER softkey can be programmed to provide access to diagnostic test functions, and is totally independent of the DIAGNOSTIC softkey or the other USER softkeys.

Program mode

Pressing the PROGRAM MODE softkey places the instrument in the Reflex Threshold Program Mode and provides access to programming functions for setting overall instrument or user-specific defaults. Tests can not be performed in the Program Mode. Pressing the PROGRAM MODE softkey displays the PROGRAM MODE message in the status area of the screen.



System in PROGRAM MODE

Once the system is in the Program Mode, select the test (diagnostic or user-specific) for which defaults will be defined. Pressing any softkey displays the Reflex Threshold mode softkey menu across the bottom of the screen with a PROGRAM MODE status message.

Test parameters can now be selected from the usual softkey menu as done in preparation for a test. Once all the test parameters have been selected, pressing the RETURN hardkey returns the display to the PROGRAM MODE submenu.

Pressing the STORE softkey stores the selected parameters as defaults for future tests. The STORING DATA status message will be displayed. Press the REFLEX (or other test mode) hardkey to return from the Program Mode to the Reflex Threshold mode with the new test parameter defaults.

To run a reflex threshold diagnostic test, press the REFLEX hard key. To select a USER reflex threshold test, press the REFLEX hardkey followed by the RETURN hardkey and then the USER softkey.

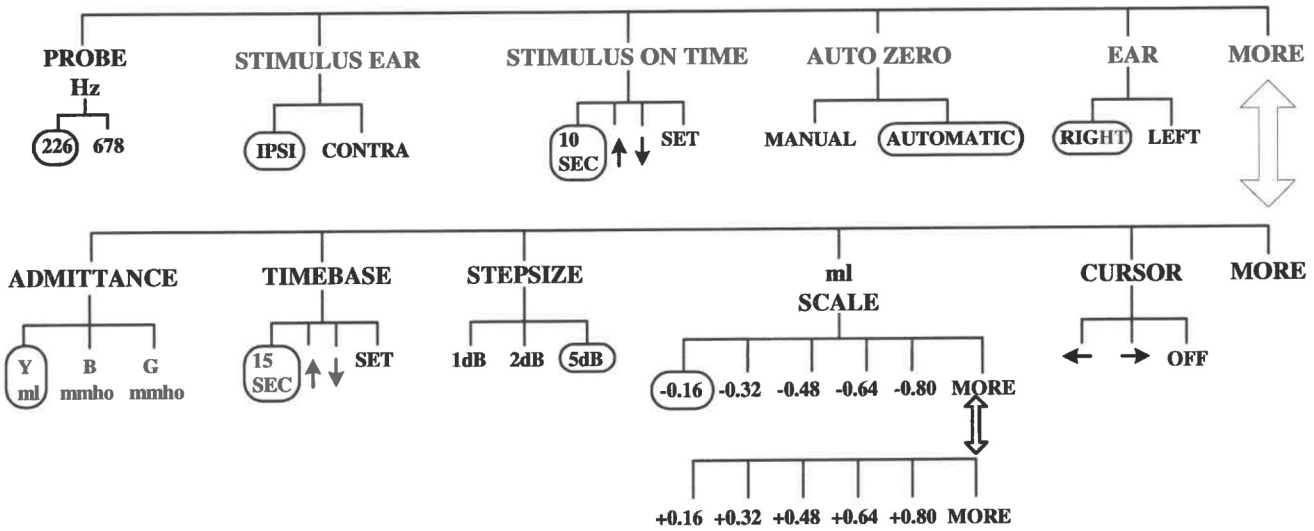
Reflex Decay testing

Reflex Decay is a diagnostic test particularly useful in confirmation of retrocochlear pathology. The stimulus for the test is typically presented as a steady tone, Ipsilaterally or Contralaterally at 10 dB HL above reflex threshold intensity level. 500 Hz and 1000 Hz are the best frequencies for this test.

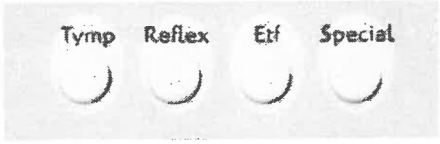
An individual exhibits adaptation (decay) if the amplitude of the reflex response decays to 50% of peak amplitude typically within 10 seconds.

Softkey menu structure

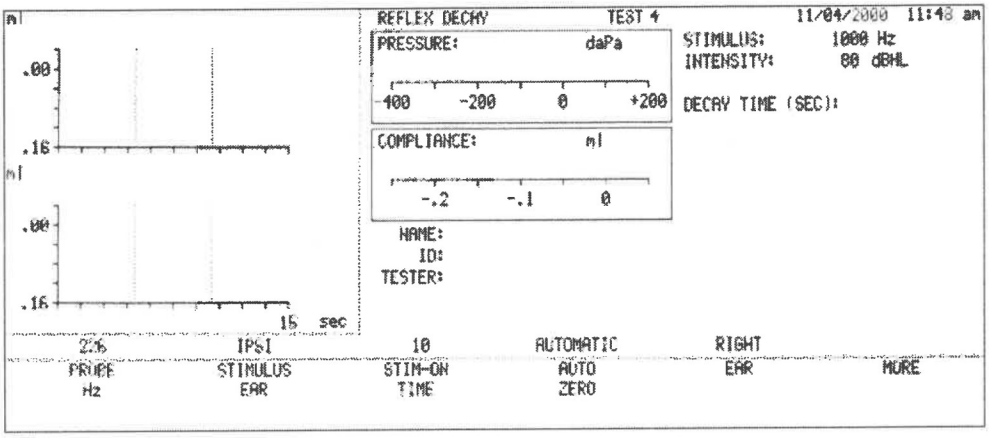
The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.



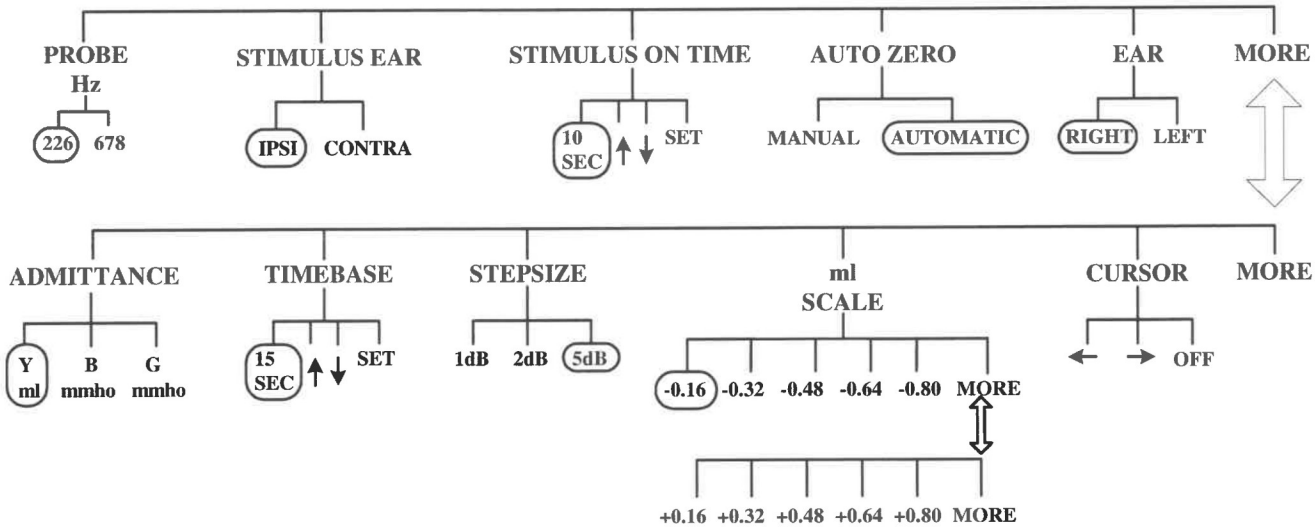
1) Press the SPECIAL hardkey to enter the Reflex Decay test mode.



2) Default test parameters are displayed above the softkeys across the bottom of the LCD screen.



3) Press the EAR softkey to toggle between the right and left ear, then if desired, navigate through the Reflex Decay softkey menu and change parameter settings for the test as required. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.



4) Reflex Decay testing may be performed with probe tone frequencies of 226 Hz and 678 Hz. "Y", "B", and "G" may be selected.

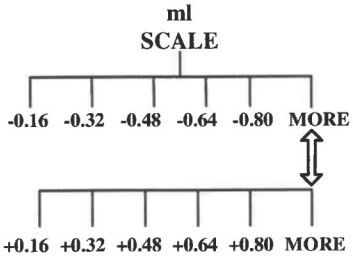
Minimum and maximum timing levels allowable in Reflex Decay

5) The maximum selectable On Time of the stimulus is limited by the selected Timebase as shown in the following table:

	TIMEBASE			
Time in Seconds	15.00	30.00	45.00	60.00
Prestimulus Time	1.50	3.00	4.50	6.00
Minimum On Time	1.00	1.00	2.00	2.00
Maximum On Time	13.00	27.00	40.00	54.00
On Time Increment	1.00	1.00	2.00	2.00

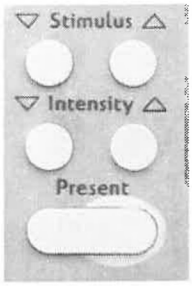
6) The 5 and 10 second points on the 15 and 30 second timebases are identified by vertical lines on the LCD and printout.

7) Press the ml SCALE softkey to select a sensitivity for the display of test results. Press the MORE softkey to select positive sensitivity scales for the display of reflex tracings deflected upward.

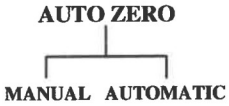


8) Stimulus and Intensity levels are displayed to the right of the meter area of the LCD as follows:
   STIMULUS: 500 Hz
   INTENSITY: 80 dBHL

9) Press the appropriate INTENSITY hardkey to select an intensity 10 dB above the reflex threshold intensity level found previously.

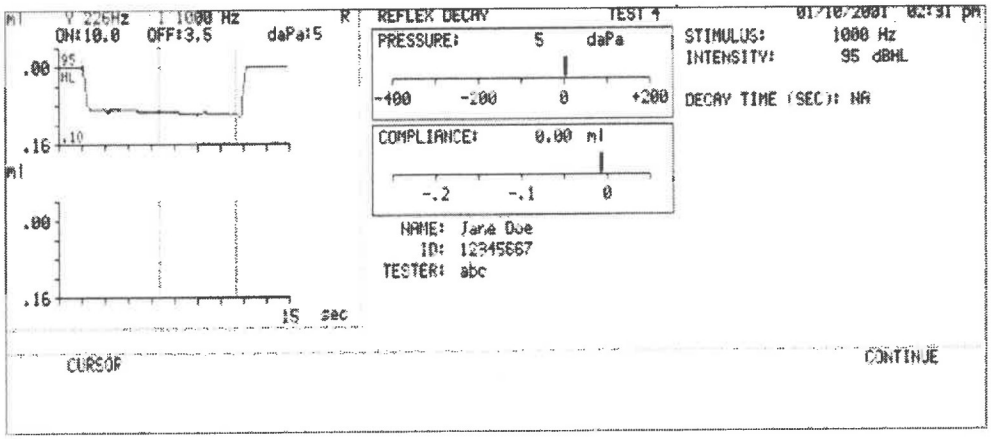


10) Admittance can be automatically zeroed each time the PRESENT hardkey is pressed to maintain a constant baseline. To activate this feature, press the AUTO ZERO softkey and then press AUTOMATIC before the START key is pressed.



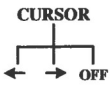
11) Press the PRESENT hardkey momentarily. A brief prestimulus baseline will be drawn. The selected stimulus will be presented for the preset time. The fixed Off Time following the signal allows visualization of recovery.

12) View the change in admittance over time on the graphic display and on the Pressure and Compliance Meters.

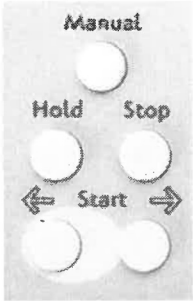


13) Numeric data is summarized to the right of the meter area. The time at which the response decayed to 50% of peak amplitude is identified as DECAY TIME (SEC) (if applicable).

14) The CURSOR softkeys may be used to call out numeric points on Line 1 and Line 2 of the graphics area.



15) Depress the CONTINUE softkey to resume tracings on the next line or next page.



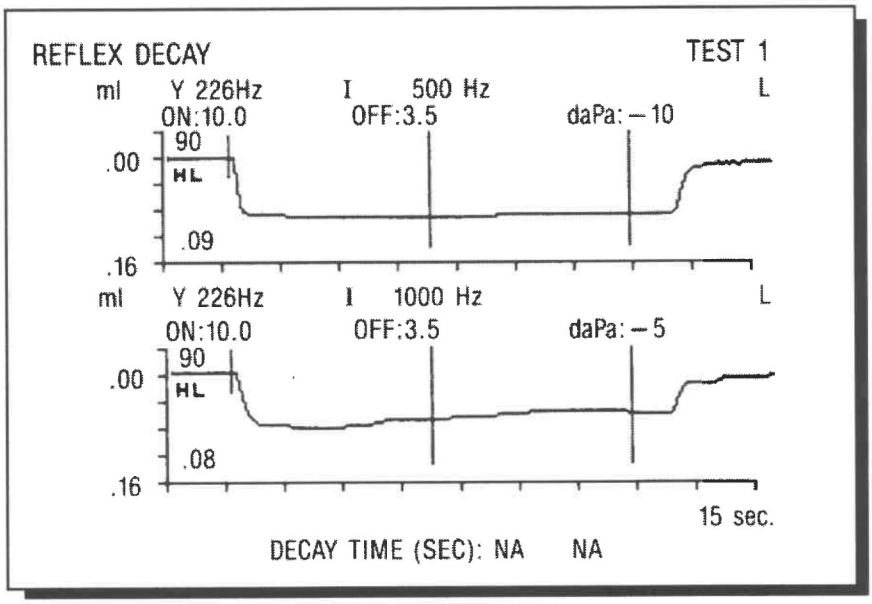
16) Press the STOP hardkey to end and store the Reflex Decay Test.

17) Test data can be erased or cleared using the ERASE or CLEAR hardkey on the LCD panel. Please refer to Erasing and clearing test data earlier in this chapter.

18) Test data can be recalled by PAGING through the test screens. Please refer to Paging test data and the cursor earlier in this chapter.

Reflex Decay sample printout

19) The test data is automatically stored at the completion of the test and may be selected using the PAGE hardkey and printed by pressing the PRINT hardkey.



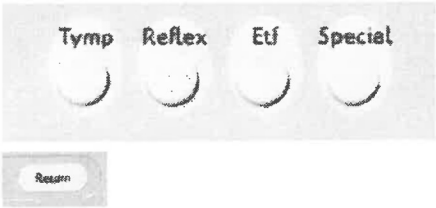
NOTE
The letters "NA" indicate that no decay occurred during the test.

Program mode for Reflex Decay

Default test parameters may be programmed for the system Reflex Decay tests.

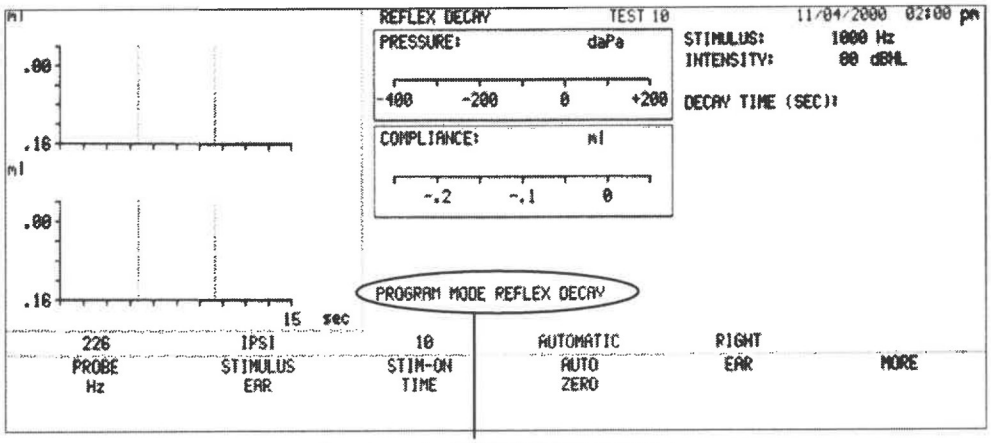
The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

Press the SPECIAL hardkey, then press the RETURN hardkey to display the Special tests sub-menu.



Pressing the PROGRAM MODE softkey places the instrument in the Program Mode and provides access to programming functions for setting overall instrument defaults. Tests can not be performed in the Program Mode. Pressing the PROGRAM MODE softkey displays the PROGRAM MODE message in the status area of the screen.

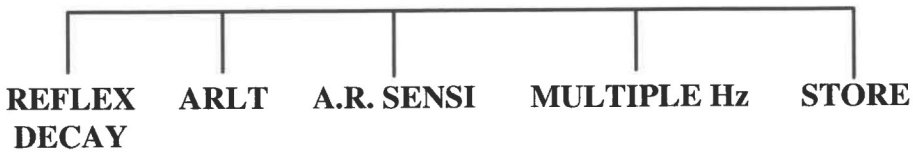
Once the system is in the Program Mode, press the REFLEX DECAY softkey to display the Reflex Decay menu across the bottom of the screen. The PROGRAM MODE REFLEX DECAY status message will be shown in the status area of the screen.
Test parameters can now be selected from the usual softkey menu as done in prepa-



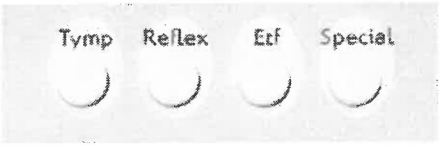
System in PROGRAM MODE

ration for a test. Once all the test parameters have been selected, pressing the RETURN hardkey returns the display to the PROGRAM MODE sub-menu.

Pressing the STORE softkey stores the selected parameters as defaults for future



tests. The STORING DATA status message will be displayed. Press the SPECIAL (or other test mode) hardkey to return from the Program Mode to the Reflex Decay test with the new test parameter defaults.



One purpose of the Eustachian tube is to equalize pressure between the middle-ear space and ambient pressure. Normally, the Eustachian tube temporarily opens during a swallow or yawn; thereby, allowing an exchange of air between the middle-ear and the nasopharynx. Between swallows, slight fluctuations may occur in the pres-

Eustachian Tube Function Testing for Intact Eardrums

sure level within the middle-ear since the cells which line the middle-ear absorb air from the cavity. If the Eustachian tube should remain closed for an extended period of time, a negative pressure (relative to atmospheric pressure) may develop within the middle-ear. This causes the tympanic membrane to retract inward, thus stiffening the eardrum. (Air pressure is decreased at the rate of 50 mm H_2O/hour if the tube remains closed.) In time, fluid may develop within the middle-ear space further stiffening the middle-ear system and reducing the ability of the ossicular chain to conduct sound to the cochlea.

Since a malfunctioning Eustachian tube can lead to middle-ear disease and hearing loss, it is helpful to be able to determine the patency of the Eustachian tube in patients who are susceptible to middle-ear problems.

The purpose of this test is to try to force the Eustachian tube to open through use of pressure gradients and swallowing on the part of the patient. A series of three tympanograms are obtained under the three different conditions described below.

Pressure-swallow test

NOTE
In each case, to avoid the effects of hysteresis, the tympanogram is recorded in the SAME sweep direction.

Condition #1:
A tympanogram sweep is performed with the normal pressure range selected (+ 200 to - 400 daPa).

Condition #2:
A positive pressure of 400 daPa is established within the ear canal, and the eardrum is pushed inward. As this membrane moves inward, the volume of the middle-ear space is reduced. This, in turn, causes air that is present within the middle-ear space to be more compressed, so that as the patient swallows and the Eustachian tube opens, more air than normal flows out of the middle-ear. When the Eustachian tube closes and the ear canal is no longer subjected to induced positive pressure, less air than normal is present within the middle-ear space. In other words, there is negative pressure within the middle ear. Therefore, when the second tympanogram is recorded, the point of peak mobility will be shifted in the negative direction (approximately 15 to 20 daPa) relative to the point of peak mobility recorded during the first tympanogram.

Condition #3:
A negative pressure of 400 daPa is established within the ear canal. As the pressure is reduced within the ear canal, the eardrum moves outward. Stressing the membrane outward leads to a temporary increase in middle-ear cavity volume. When the same amount of air is present within a larger volume, the air pressure within the

cavity is reduced. Thus, the middle-ear pressure is negative relative to atmospheric pressure. As the patient drinks some water and the Eustachian tube opens, more air than normal will flow into the middle-ear space. When the Eustachian tube closes and the ear canal is vented, a positive pressure condition will exist within the middle-ear relative to atmospheric pressure. When the third tympanogram is recorded, the point of peak mobility will be shifted in the positive direction (approximately 15 to 20 daPa) relative to the first tympanogram.

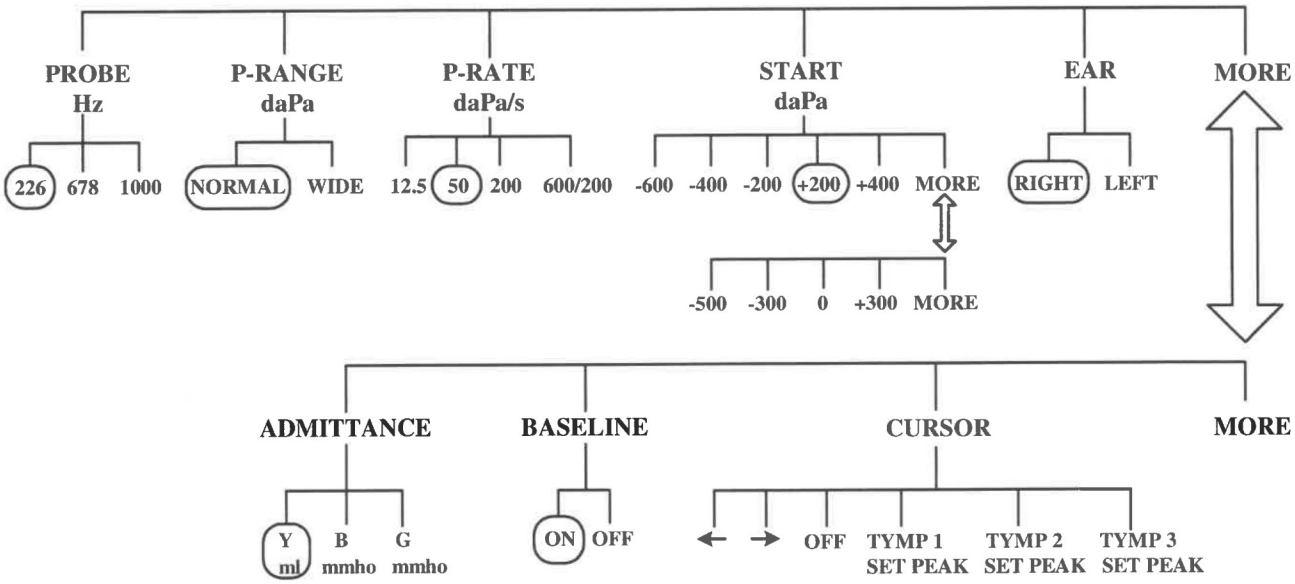
NOTE
If the Eustachian tube is functioning properly, a shift in the pressure peak of approximately 15 to 20 daPa in both directions will be observed. However, if the Eustachian tube is malfunctioning, there will be little, if any, observable difference in the pressure peak recorded from Condition #1, to Condition #2, to Condition #3.

NOTE

The structure of softkey menu selections are diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

Softkey menu structure

1) Press the ETF hardkey to select the ETF test mode and display the ETF- Intact menu.

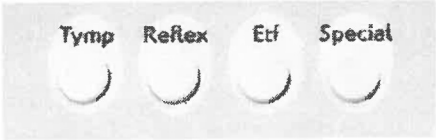


2) Pressure range automatically defaults to the Normal.

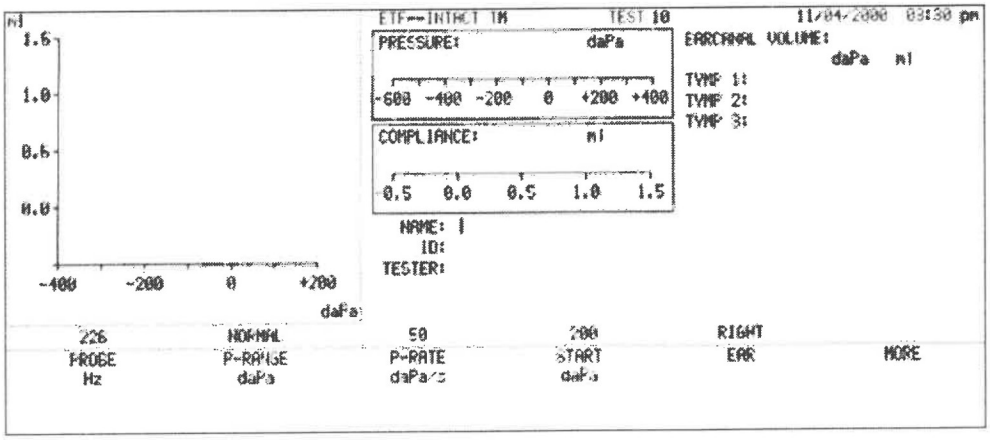
3) Default test parameters are displayed above softkeys on the LCD.

ETF-Intact automatic test procedure

4) ETF testing may be performed with probe tone frequencies of 226 Hz, 678 Hz, and 1000 Hz. "Y", "B", and "G" may be selected.



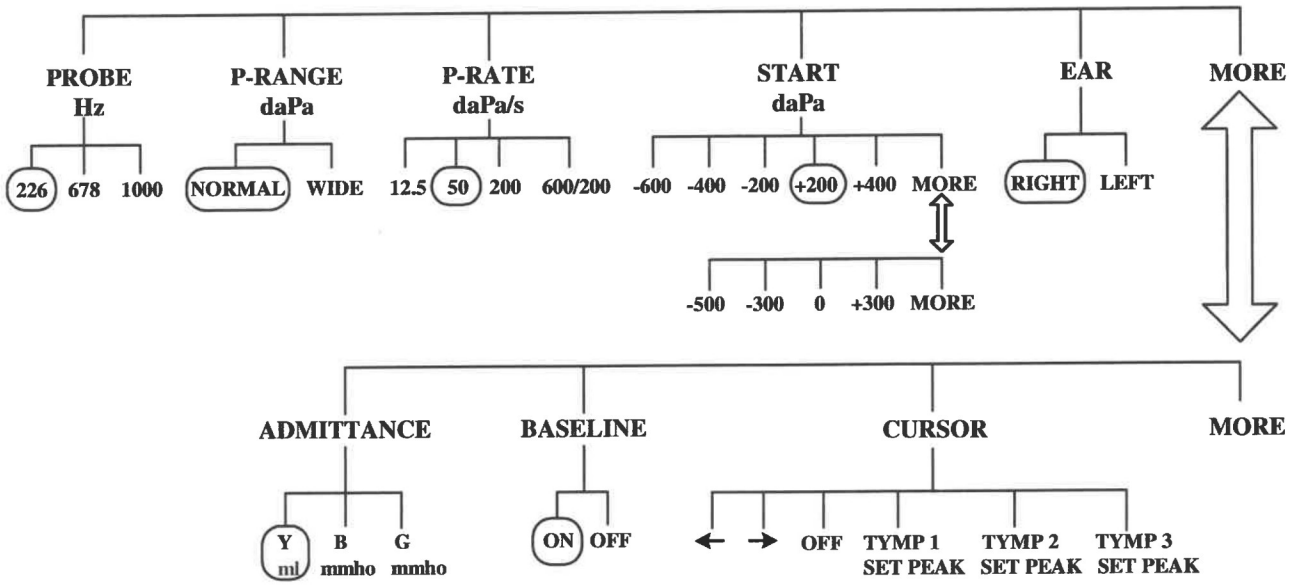
5) Press the EAR softkey to toggle between the right and left ear, then if desired, navigate through the ETF-Intact softkey menu and change



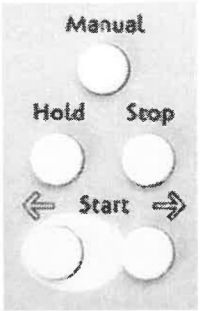
parameter settings for the test as required. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

6) With the probe eartip securely sealing the ear canal, press the START hardkey.

7) The ear canal will be pressurized to +200 daPa. The pressure will automatically sweep to -400 daPa or until



the HOLD hardkey is pressed. The ear canal will be vented. ←



8) The ear canal will AUTOMATICALLY be pressurized to +400 daPa. Pressure will be maintained while a prompt message on the LCD directs the operator to have patient swallow water. The ear canal will be vented, once the CONTINUE softkey is pressed.

9) Tymp #2 will sweep automatically as above. The ear canal will be vented when either -400 daPa is reached or the HOLD hardkey is pressed.

10) The ear canal will AUTOMATICALLY be pressurized to -400 daPa. Pressure will be maintained while a prompt message asking to have patient swallow is displayed. The ear canal will be vented once the CONTINUE softkey is pressed.

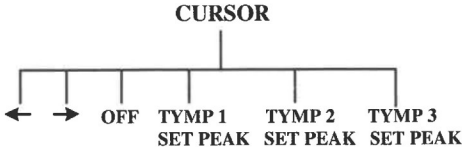
11) Tymp #3 will sweep automatically as above.

NOTE
The anatomical structure of the Eustachian tube is such that equalization of negative pressure in ear canal is more difficult than equalization of positive pressure.

NOTE

12) The CURSOR softkeys may be used to numerically identify peak points when using 678 or 1000 Hz.

13) Tymps #1, #2 and #3 are displayed and stored on the same page in memory for recall.



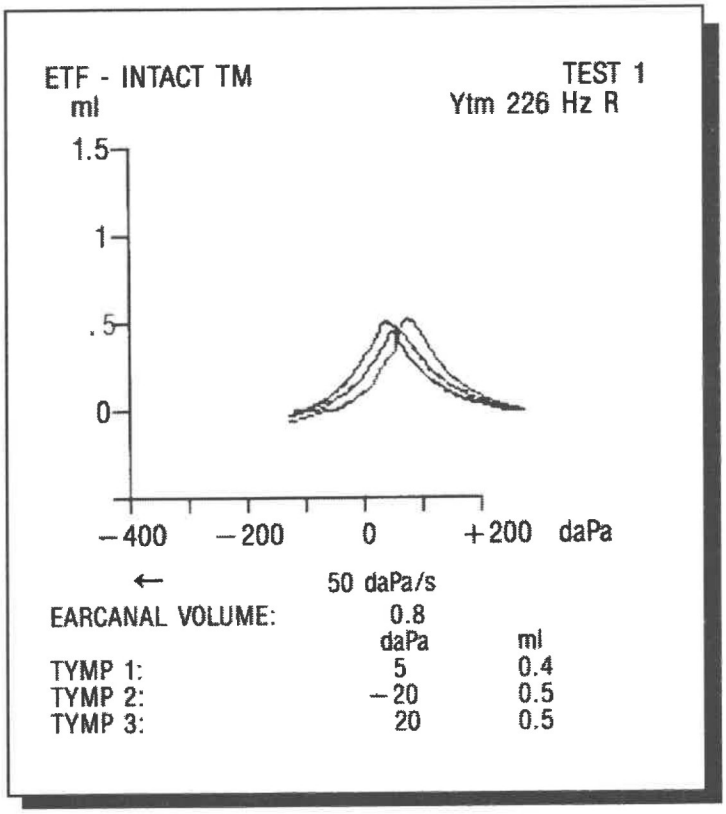
14) Test data can be erased or cleared using the ERASE or CLEAR hardkey on the LCD panel. Please refer to Erasing and clearing test data earlier in this chapter.

15) Test data can be recalled by PAGING through the test screens. Please refer to Paging test data and the cursor earlier in this chapter.

16) The test data is automatically stored at the completion of the test and may be printed by selecting the test number using the PAGE hardkey, followed by pressing the PRINT hardkey.

ETF-Intact sample printout

17) Numeric summary data appears to the right of the meters on the LCD as follows:



EAR CANAL VOLUME: (for Tymp #1 only)

	daPa	ml
TYMP 1:	5	0.4
TYMP 2:	-20	0.5
TYMP 3:	20	0.5

ETF-Intact normative data

The amount of pressure peak shift between tymp tracings is relatively small (i.e. 15 - 20 daPa) or nonexistent if there is an ETF problem. An observable peak shift for tracing #3 is difficult to obtain even for normally functioning Eustachian tubes.

The operator may follow a protocol similar to that outlined by Holmquist for determining patency of the Eustachian tube in a patient with pressure equalization tubes in place or with a perforated eardrum.*

Eustachian Tube function testing for Perforated Eardrums

During the test, positive (or negative) pressure is presented to the ear canal/ middle-ear space until a pre-selected pressure limit is reached. The purpose of this test is to determine if the Eustachian tube will open as a direct result of this pressure. Specific opening pressure provides some information about the status of the tube (i.e., properly functioning vs. malfunctioning). It is suggested that the operator perform the ETF test with the maximum pressure (+400 daPa) pre-selected. This eliminates the possibility of the Eustachian tube not opening at a lower pressure which might otherwise be forced open closer to the maximum pressure value.

If the tube opens as a direct result of the pressure within the ear canal/middle-ear space, only a portion of the positive pressure will escape before the tube closes again.

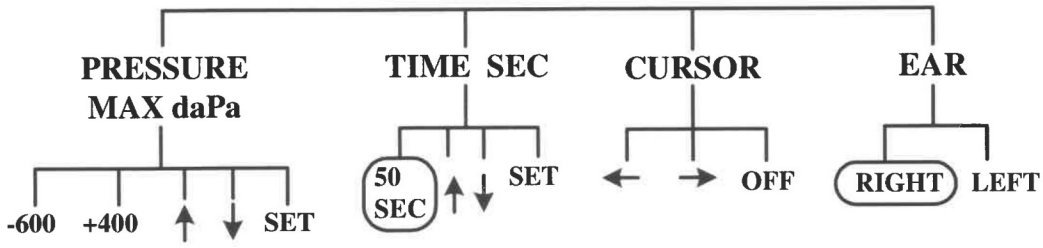
NOTE
If negative pressure is used during the test and the tube opens, some air will enter the ear canal/middle-ear, thereby, reducing the amount of negative pressure.

NOTE

To further check the Eustachian tube function while a pressure gradient exists between the ear canal/middle-ear space and the nasopharynx, the patient is asked to swallow some water. If the tube is functioning properly, some air pressure will be released as the patient swallows the water. If the tube is malfunctioning, very little (if any) pressure will be released. Thus, it is possible to record changes in pressure when the Eustachian tube opens and closes in response to swallowing as a function of time.

The structure of softkey menu selections are diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

Softkey menu structure

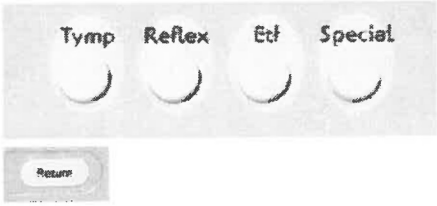


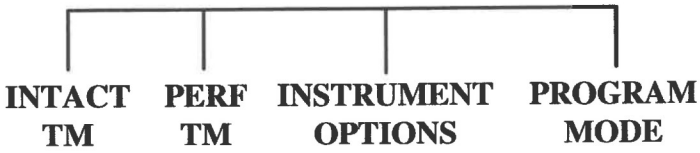
1) Press the ETF hardkey to select the ETF test mode, then press the RETURN hardkey to display the ETF sub-menu.

** Holmquist, J., "Eustachian Tube Evaluation," Acoustic Impedance and Admittance - The Measurement of Middle Ear Function, A. Feldman and L. Wilber, eds. Williams and Wilkins, 1976.*

ETF-Perforated TM automatic test procedure

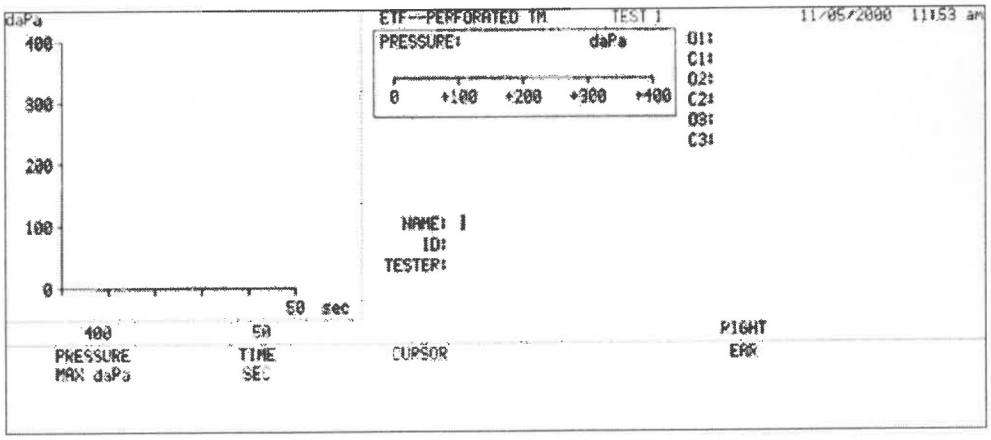
2) Press the PERF TM softkey to place the instrument in the ETF-Perforated TM test mode. Default test parameters will be displayed above the



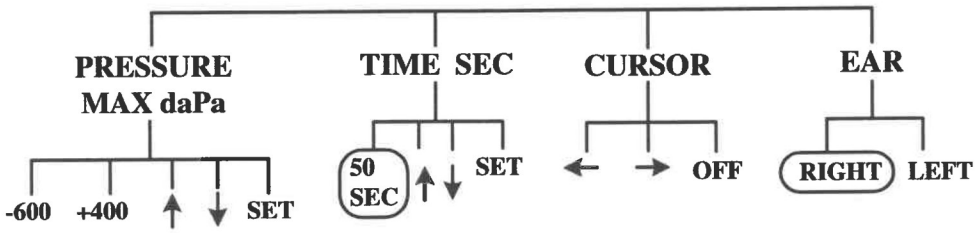


softkeys on the LCD.

3) Press the EAR softkey to toggle between the right and left ear, then if desired, navigate through the ETF-Perforated TM softkey menu and change



parameter settings for the test as required. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

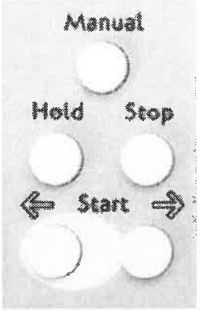


The minimum and maximum levels allowable in the ETF - Perforated TM mode are shown below:

Minimum and maximum levels allowable

Default	Minimum	Maximum	Increment
Pressure Max			
+400	-600 daPa	+400 daPa	50 daPa
Time			
50 Seconds	30 Seconds	60 Seconds	10 Seconds

4) Ensure that the probe is placed securely in the ear canal and press the START hardkey.



5) The pressure will swe 0 daPa/sec. toward the selected maximum pressure value for the test.

6) The pressure sweep as a function of time can be viewed on the graphic display on the LCD.

7) If the Eustachian tube opens before the maximum pressure is reached, the tracing will indicate the pressure value where the tube opened as O_1. The reduced pressure value where the tube closes again is recorded as C_1.

8) If the Eustachian tube does not open before the maximum pressure is reached, the tracing will continue at the maximum pressure as a straight line.

9) Instruct the patient to swallow water while the tracing is in progress.

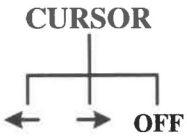
10) If the Eustachian tube opens while swallowing, some pressure will be released from the ear canal/middle-ear space.

11) The tracing will move downward to the pressure level present after the tube closes again.

12) Repeat steps 9 through 11 until no more pressure is released while swallowing, or until the allowable time has elapsed.

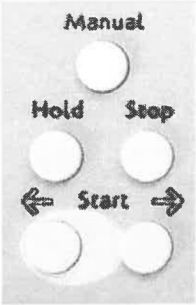
13) The opening and closing pressures are summarized to the right of the meter area on the LCD.

14) The CURSOR softkeys may be selected to call out numeric points on the X (time) and Y (pressure)axes.



15) Terminate the test at any point and store in memory by

selecting the STOP hardkey.

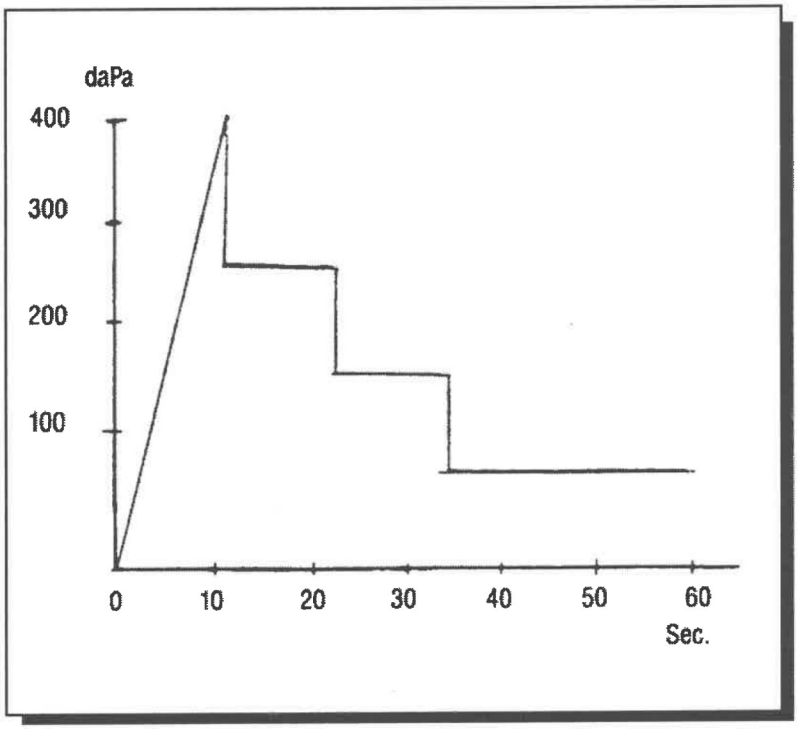


16) Test data can be erased or cleared using the ERASE or CLEAR hardkey on the LCD panel. Please refer to Erasing and clearing test data earlier in this chapter.

17) Test data can be recalled by PAGING through the test screens. Please refer to Paging test data and the cursor earlier in this chapter.

18) The test data may be printed by pressing the PRINT hardkey after selecting the test number using the PAGE hardkey.

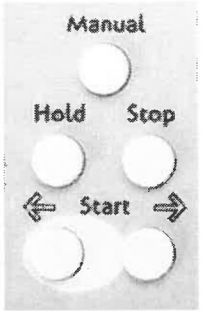
ETF-Perforated TM sample printout



1) After placing the instrument in the ETF-Perforated TM

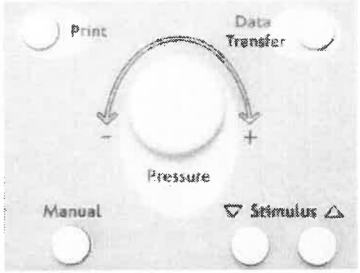
ETF-Perforated TM manual test procedure

test mode, press the MANUAL hardkey.



2) The Pressure Knob will allow the pressure to sweep only in the direction of the pre-selected maximum pressure (i.e. +400 daPa).

3) The Pressure Knob will be inactivated once the maximum pressure is established.



4) A prompt message on the LCD will inform the user when the previously set maximum pressure is reached, or if the Eustachian tube has opened.

ETF-Perforated TM normative data

A healthy Eustachian tube has been shown to open at approximately + 150 mm H_2O *.

A higher pressure level (i.e.greater than +350 mm H_2O) might be required to open a blocked Eustachian tube.

NOTE
1.02 mm H_2O=1 daPa

Default test parameters may be programmed for the ETF-Intact and ETF-Perfo-

** Holmquist, J., "Eustachian Tube Evaluation," Acoustic Impedance and Admittance - The Measurement of Middle Ear Function, A. Feldman and L. Wilber, eds. Williams and Wilkins, 1976.*

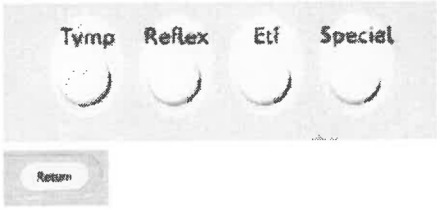
Program mode for ETF

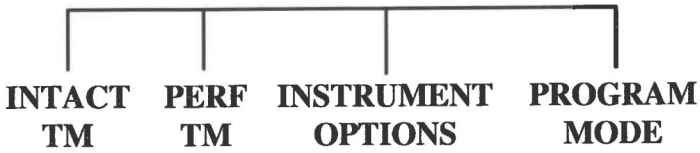
rated TM test modes.

Softkey menu structure

The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

Press the ETF hardkey, then press the RETURN hardkey to display the ETF submenu.

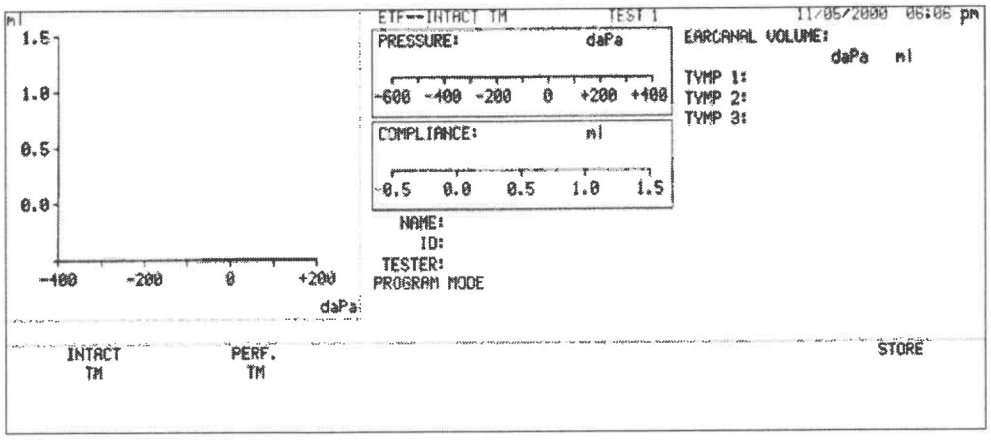




Pressing the INTACT TM or PERF TM softkey provides direct access to ETF-Intact TM or PERF TM test functions that use the system defaults. For example, to run ETF-Intact TM tests with system defaults from this menu, press the INTACT TM softkey.

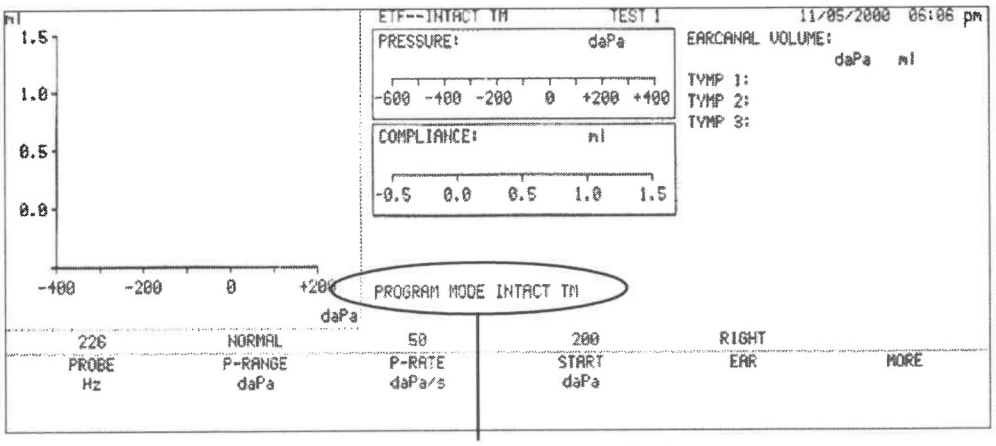
Program mode

Pressing the PROGRAM MODE softkey places the instrument in the Program Mode and provides access to programming functions for setting ETF-Intact TM or PERF TM test function defaults. Tests can not be performed in the Program Mode. Pressing the PROGRAM MODE softkey displays the PROGRAM MODE message in the status area of the screen.



Once the system is in the Program Mode, select the test (ETF-Intact TM or PERF TM) for which defaults will be defined. The appropriate ETF screen will be displayed with the softkey menu across the bottom of the screen and a PROGRAM MODE status message.

Test parameters can now be selected from the usual softkey menu as done in prepa-



System in PROGRAM MODE

ration for a test. Once all the test parameters have been selected, pressing the RETURN hardkey returns the display to the PROGRAM MODE sub-menu.

Pressing the STORE softkey stores the modified parameters as defaults for future tests. The STORING DATA status message will be displayed. Press the ETF (or other test function) hardkey to return from the Program Mode to the ETF-Intact test mode with the new test parameter defaults.

In broad terms, Acoustic Reflex Latency is the time interval between the onset of an acoustic stimulus and the onset of the stapedius muscle contraction. Investigators

ARLT-Special test mode

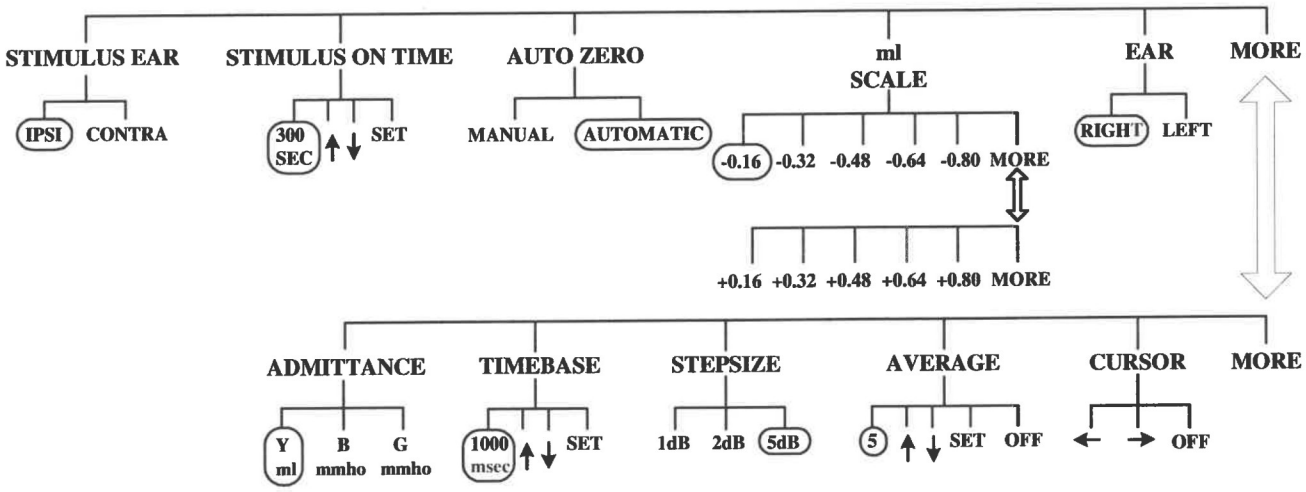
have reported prolongation of latency with retrocochlear disorders. There is an awareness that the Acoustic Reflex Latency Test (ARLT), a simple clinical procedure, can be a sensitive indicator in distinguishing cochlear from retrocochlear lesions. Interest has focused on latency characteristics, rise and fall times of the reflex response, amplitude, and recovery characteristics. The definitions of these parameters are variable among investigators.

Acoustic Reflex Latency is dependent on frequency, intensity, and rise/fall times of the eliciting stimulus. The protocol for this test requires the presentation of an Ipsilateral or Contralateral reflex-activating stimulus (rise time equal to or greater than 5 msec.) at 10 dB above acoustic reflex threshold level. Averaging the reflex responses improves the signal/noise ratio and thus smoothes the displayed response.

Softkey menu structure

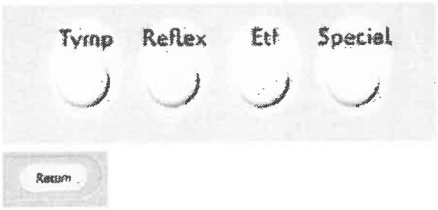
The structure of softkey menu selections are diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

1) Press the SPECIAL hardkey and then the RETURN hardkey to display the SPECIAL menu across the bottom of

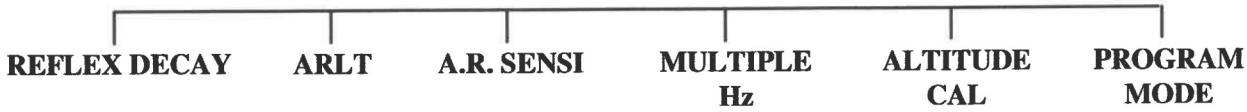


ARLT test procedure

the LCD.

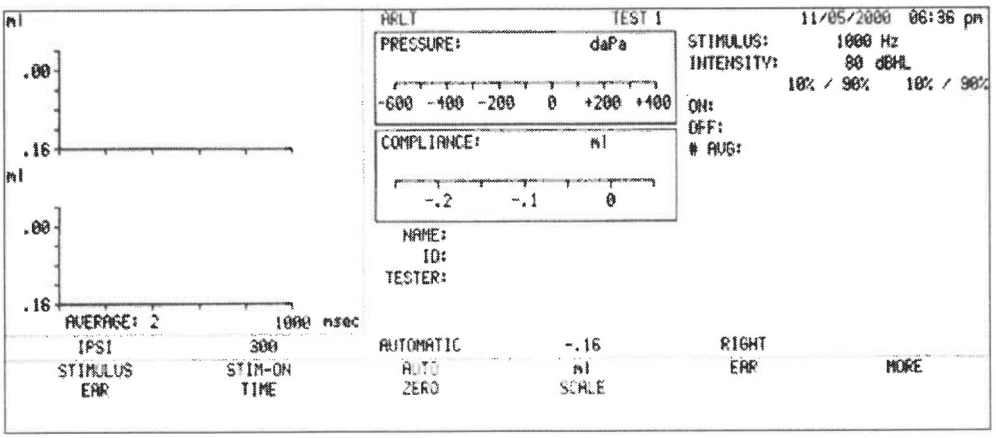


2) Press the ARLT softkey to place the instrument in the ARLT test mode and

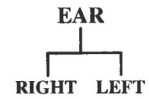


display the ARLT softkey menu.

3) Default test parameters are displayed above softkeys on the LCD.
4) ARLT testing may be performed with a probe tone frequency of 226 Hz. "Y", "B", and "G" may be selected.



5) Press the EAR softkey to toggle between the right and left ear, then if desired, navigate through the ARLT softkey menu and change parameter settings for the test as required. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

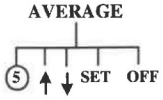


The maximum selectable On Time of the stimulus is limited by the selected Timebase. See the table shown below:

Minimum and maximum timing levels allowable in ARLT

	TIMEBASE			
Time in Seconds	500	1000	1500	2000
Prestimulus Time	50	100	150	200
Minimum On Time	100	100	150	150
Maximum On Time	450	900	1350	1800
On Time Increment	50	50	150	150

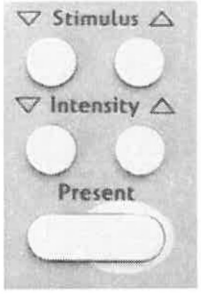
6) Press the AVERAGE softkey to select the number of reflex responses to be averaged. Select from 2 to 50 averages.



7) Stimulus and Intensity levels are displayed to the right of the meter area of the LCD as follows:
   STIMULUS: 1000 Hz
   INTENSITY: 80 dBHL

8) Use the appropriate INTENSITY hardkey to select an intensity 10 dB above the reflex threshold previously

measured.



9) Use the AUTO ZERO softkey (if necessary) to assure zeroing of admittance meter prior to presenting the stimulus. Admittance can be automatically zeroed each time the PRESENT hardkey is pressed to maintain a constant baseline. To activate the this feature, press the AUTO ZERO softkey and then press AUTOMATIC before pressing START.

AUTO ZERO
MANUAL AUTOMATIC

10) Press PRESENT hardkey momentarily. A brief prestimulus baseline will be drawn. The selected stimulus will be presented for preset On Time, and for the number of averages selected.

11) Upon completion of the test, the following points are identified by vertical lines on the ARLT display: (See the ARLT sample printout)

Initial Latency (Li)	=	Time from signal onset to the point where the reflex response reaches 10% of its maximum amplitude.
Terminal Latency (Lt)	=	Time from signal offset to the point where the reflex response decays to 90% of its maximum amplitude.
Rise Time (tr)	=	Time required for the reflex response to reach from 10% to 90% of its maximum amplitude.
Fall Time (tf)	=	Time between 90% and 10% of the maximum amplitude of the reflex response following signal offset.

12) Numeric summary data appears to the right of meter area as follows:

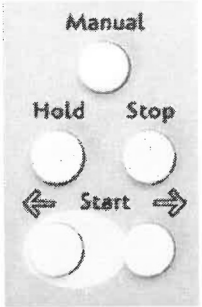
	Line 1 Data	Line 2 Data
	10% / 90%	10% / 90%
ON:		
OFF:		
AVG:		

13) Press the CONTINUE softkey to resume tracings on the next line or next page.

14) The CURSOR softkeys may be selected to call out numeric points on the X (time) and Y (amplitude) axes of Line 1 and Line 2.

15) Pressing the STOP hardkey ends ARLT test and stores

the test data.

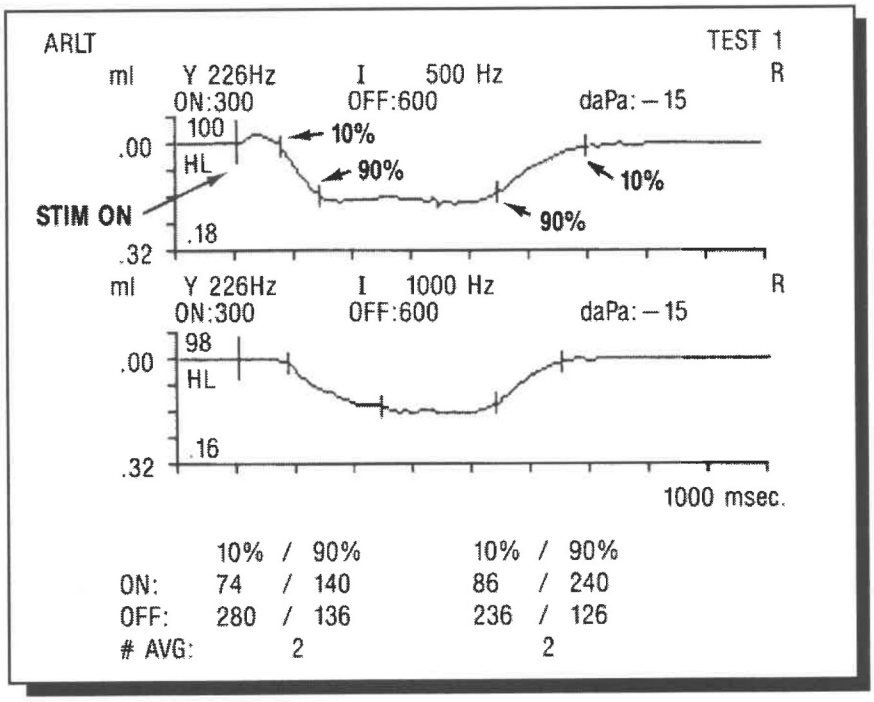


16) Test data can be erased or cleared using the ERASE or CLEAR hardkey on the LCD panel. Please refer to Erasing and clearing test data earlier in this chapter.

ARLT sample printout

17) Test data can be recalled by PAGING through the test screens. Please refer to Paging test data and the cursor earlier in this chapter.

18) The test data is automatically stored at the completion of the test and may be printed by pressing the PRINT hardkey after selecting the test number using the PAGE hardkey.



Normative test data

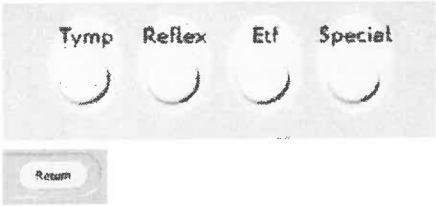
Please refer to the Bibliography (ARLT) at the end of this chapter for sources providing Normative Test data.

Default test parameters may be programmed for the system ARLT test mode.

ARLT program mode

The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

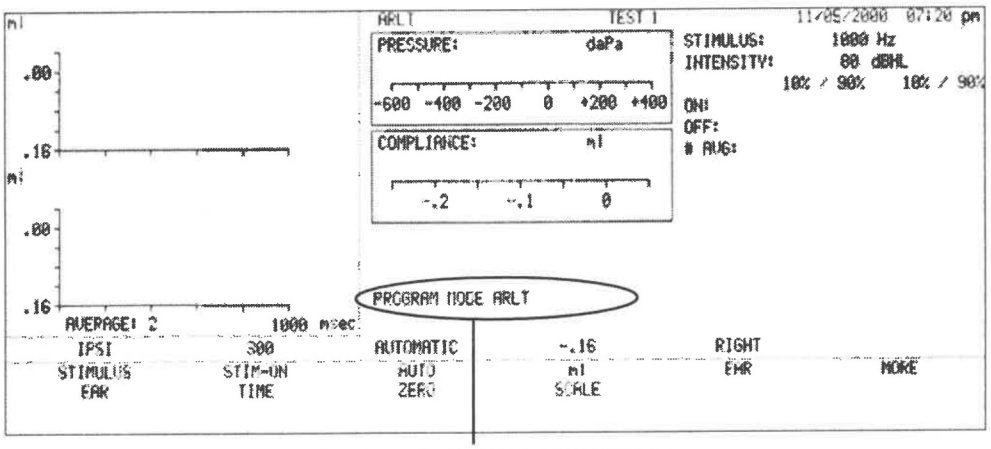
Press the SPECIAL hardkey, then press the RETURN hardkey to display the Special sub-menu.



REFLEX DECAY | **ARLT** | **A.R. SENSI** | **MULTIPLE Hz** | **ALTITUDE CAL** | **PROGRAM MODE**

Pressing the PROGRAM MODE softkey places the instrument in the Program Mode and provides access to programming functions for setting overall instrument defaults. Tests can not be performed in the Program Mode. Pressing the PROGRAM MODE softkey displays the PROGRAM MODE message in the status area of the screen.

Once the system is in the Program Mode, press the ARLT softkey to display the ARLT menu across the bottom of the screen. The PROGRAM MODE ARLT status message will shown in the status area of the screen.

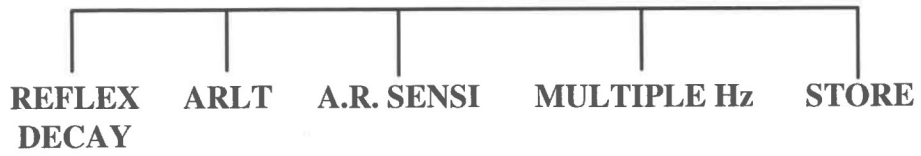


System in PROGRAM MODE

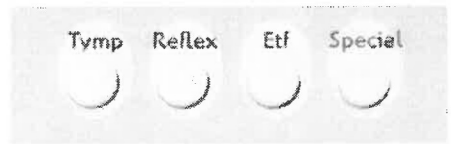
Test parameters can now be selected from the usual softkey menu as done in prepa-

ration for a test. Once all the test parameters have been selected, pressing the RETURN hardkey returns the display to the PROGRAM MODE sub-menu.

Pressing the STORE softkey stores the selected parameters as defaults for future



tests. The STORING DATA status message will be displayed. Press the ARLT (or other test mode) softkey to return from the Program Mode to the ARLT test mode with the new test parameter defaults.



Studies have shown that the acoustic reflex threshold for pure tones, which is elicited in normal hearing individuals at 70-90 dB above subjective hearing level, can be lowered by 20-30 dB (Sesterhenn, G., and Breuninger, H. 1977), and by 10-12 dB (Jeck, L., Ruth, R., and Schoeny, Z. 1983) by means of sensitization.

Acoustic Reflex Sensitization-Special Test Mode

This procedure involves the presentation of a pre-activating or simultaneous high-frequency facilitating tone with an activating tone of lower frequency. The greatest amount of facilitation occurs when the sensitizing stimulation is presented at a level just below reflex threshold. Growth of acoustic reflex amplitude was also found to be influenced by sensitization. Greater reflex threshold improvement has been noted when the facilitator and activator are presented monotically, but improvement has also been noted in the dichotic condition. Ipsi or Contra measurements may be investigated.

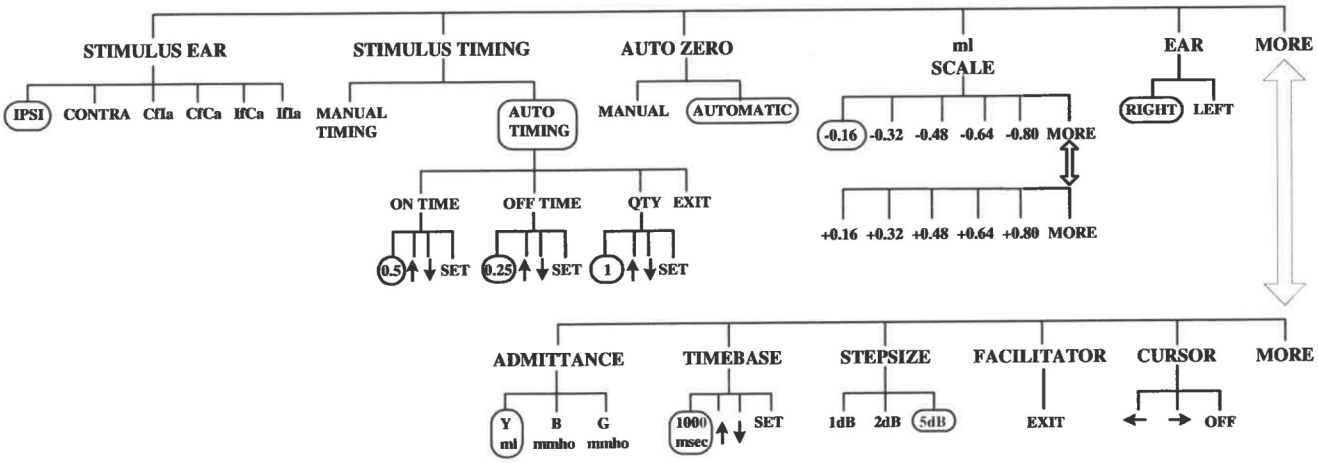
The TympStar Version 2 allows the selection of a high-frequency facilitator tone. 6 kHz or BBN (available CONTRA only) are most suitable as facilitator stimuli. The steady state facilitator and activating stimuli are presented simultaneously, Ipsilaterally or Contralaterally.

The structure of softkey menu selections are diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

1) Press the SPECIAL hardkey and then the RETURN hardkey to display the SPECIAL menu across the bottom of the LCD.

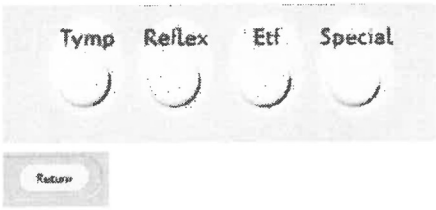
Softkey menu structure

2) Press the A.R. SENSI softkey to place the instrument in the A.R. SENSI

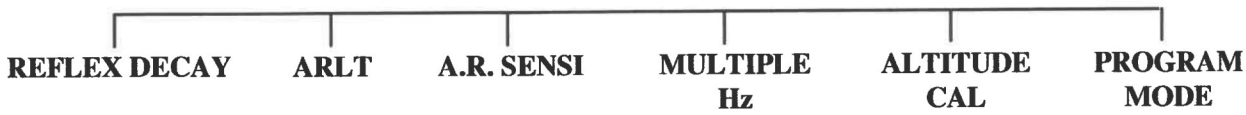


A. R. Sensitization test procedure

test mode and display the A.R. SENSI softkey menu.

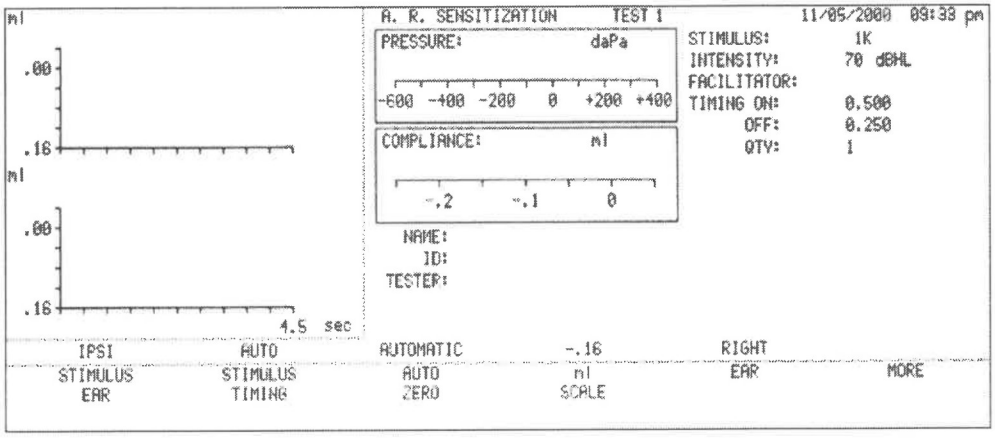


3) Default test parameters are displayed above softkeys on the LCD.



4) A.R. SENSI testing may be performed with a probe tone frequency of 226 Hz. "Y", "B", and "G" may be selected.

5) Press the EAR softkey to toggle between the right and left



ear, then if desired, navigate through the A.R. SENSI softkey menu and change parameter settings for the test as required. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

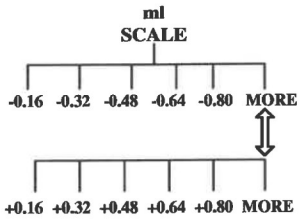
When Auto Timing is used, the maximum selectable On Time of the stimulus is limited by the selected Timebase. See the table shown below:

Minimum and maximum timing levels allowable in A.R. Sensitization

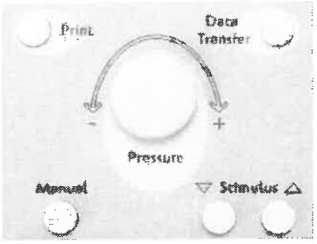
	TIMEBASE							
Times in sec.	1.500	3.000	4.500	6.000	7.500	9.000	10.500	12.000
Prestimulus Time	0.150	0.300	0.450	0.600	0.750	0.900	1.050	1.200
Inter Trace Time	0.045	0.045	0.045	0.045	0.080	0.080	0.080	0.080
Minimum On Time	0.125	0.125	0.250	0.250	0.500	0.500	0.500	0.500
Maximum On Time	1.250	2.625	4.000	5.250	6.500	8.000	9.000	10.500
On Time Increment	0.125	0.125	0.250	0.250	0.500	0.500	0.500	0.500
Off Time Increment	0.125	0.125	0.250	0.250	0.500	0.500	0.500	0.500

6) Alternative sensitivities for the displayed reflex response may be selected by pressing the ml SCALE softkey.

7) The Pressure Knob is active for fine tuning pressure.



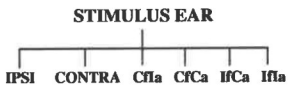
NOTE
The facilitator threshold level should be known prior to selecting the facilitator parameters. The 6 kHz or BBN-CONTRA are most suitable as facilitator stimuli.



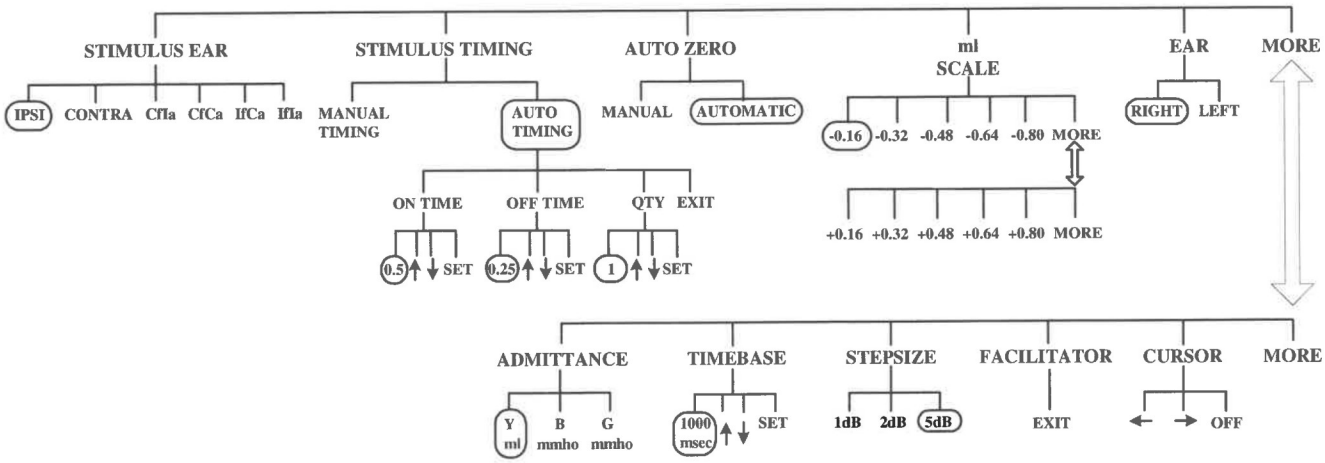
8) Reflex threshold data can be obtained for an IPSI or CONTRA stimulus. Select the STIMULUS EAR softkey if reflex threshold information for the sensitizing stimulus has not already been obtained. (Use the procedure described in the Reflex Threshold earlier in this chapter)

- Stimuli available IPSI: 0.5, 1, 2, 4, 6 kHz plus EXTERNAL and Non-Acoustic.
- Stimuli available CONTRA: 0.5, 1, 2, 4, 6 kHz plus BBN, EXTERNAL and Non-Acoustic.
- Press the STEP SIZE softkey to select an intensity step size of 1dB, 2 dB or 5 dB.
- Press the STIMULUS hardkey to select 6 kHz or BBN.
- Use the INTENSITY hardkey in 1 or 2 dB steps and PRESENT hardkey to obtain the precise reflex threshold measurements (Compliance change of 0.02 ml or greater).
- Use the AUTO ZERO softkey (if necessary) to assure baselining of compliance prior to presenting the stimulus, if AUTO ZERO is set to MANUAL. When AUTO ZERO is set to AUTOMATIC, the meters are zeroed when the PRESENT hardkey is pressed.
- Use the ERASE hardkey to eliminate sub-threshold tracings from the screen if necessary.
- If a reflex response is not elicited with a stimulus of 6 kHz or BBN Contra, obtain acoustic reflex threshold data for the highest frequency at which a reflex response can be elicited.

9) The facilitator stimulus (i.e. sensitizing signal) may be presented IPSI (If) or CONTRA (Cf). The activating stimulus may also be presented IPSI (Ia) or CONTRA (Ca). Use the STIMULUS EAR softkey to select the desired combination (i.e. CfIa, CfCa, IfCa, IfIa).

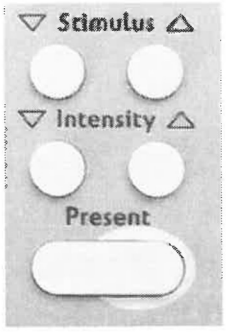


10) Upon selecting facilitator/activator parameters, the summary data to the right of the meter area of the LCD will display the facilitator default values.



11) Depress the MORE softkey and select FACILITATOR.

12) Use the STIMULUS hardkey to select the high frequency facilitating stimulus.



13) Use the INTENSITY hardkeys to select the intensity of the facilitating stimulus. (Try 3-4 dB below its threshold)

14) Press the EXIT softkey to set the facilitator stimulus and intensity.

15) The activator stimulus and intensity may now be selected.
- Press the STIMULUS hardkey to select the desired stimulus.
  * Stimuli available IPSI: 0.5, 1, 2, 4 kHz, EXTERNAL and Non-Acoustic.
  * Stimuli available CONTRA: 0.25, 0.5, 1, 2, 4 kHz, BBN, EXTERNAL and Non-Acoustic.

NOTE
The same stimulus cannot be selected as the facilitator and the activator

- Press the STEP SIZE softkey to select 1, 2, or 5 dB steps, and the INTENSITY hardkey to select the intensity level of the stimulus. Start the intensity of the activator at a very low level, i.e. 40 dB and follow an ascending pattern to arrive at a threshold value.

16) Press the PRESENT hardkey to simultaneously present the facilitating and activating stimuli.

17) Press the ERASE hardkey on the LCD panel to delete sub-threshold data (i.e. amplitudes below .02 ml).
18) Select the CONTINUE softkey to allow reflex tracings to continue onto

the next line of reflex screen, or onto next page.

19) The CURSOR softkeys may be used to examine data points from individual tracings.

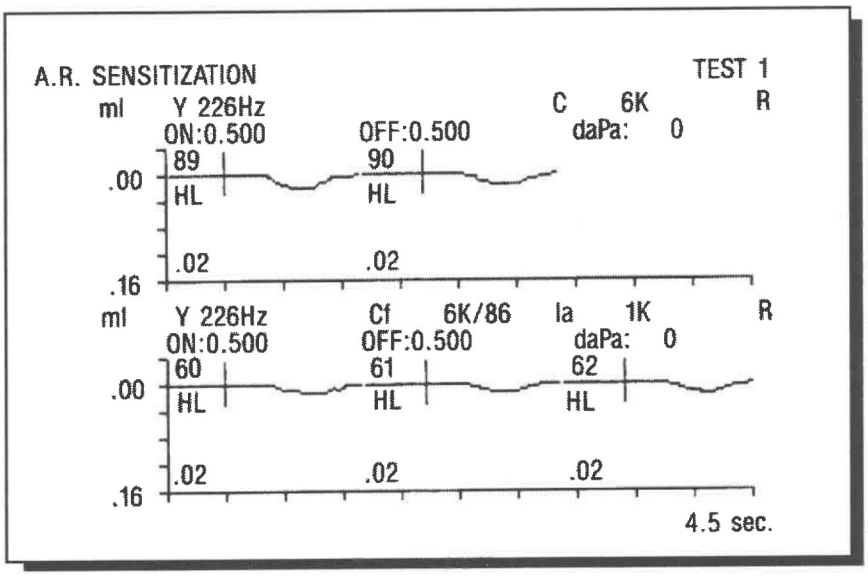
20) Press the STOP hardkey to terminate testing and store the test data.

21) Test data can be erased or cleared before pressing CONTINUE or STOP using the ERASE or CLEAR hardkey on the LCD panel. Please refer to Erasing and clearing test data earlier in this chapter.

22) Test data can be recalled by PAGING through the test screens. Please refer to Paging test data and the cursor earlier in this chapter.

A. R. Sensitization sample printout

23) The test data is automatically stored at the completion of the test and may be printed by pressing the PRINT hardkey after selecting the test number using the PAGE hardkey.

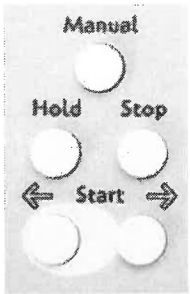


1) While in the A. R. SENSITIZATION mode select desired test parameters

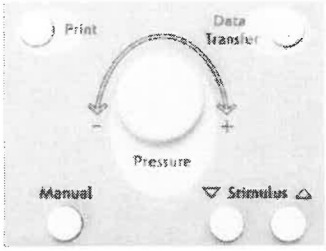
A. R. Sensitization - manual test procedure

as previously described for A. R. Sensitization automatic testing.

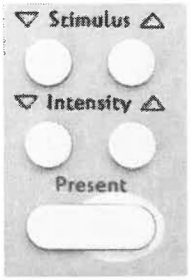
2) Press the MANUAL hardkey. Selection of MANUAL is invalid if ear is pressurized. The STOP hardkey must first be pressed.

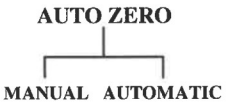


3) Fine tune the pressure if necessary by rotating the PRESSURE knob.



4) Use the AUTO ZERO softkey (if necessary) to assure zeroing of admittance meter prior to presenting the stimulus. Admittance can be automatically zeroed each time the PRESENT hardkey is pressed to maintain a constant baseline. To activate this feature, press the AUTO ZERO softkey and then press AUTOMATIC before selecting START.





5) Depress PRESENT hardkey. View the Admittance Meter for a detectable admittance change.

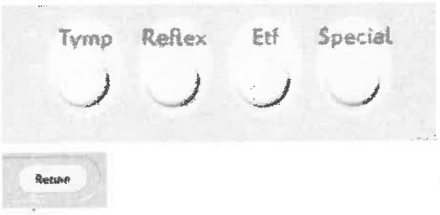
The intensity level may be changed between stimulus presentations.

A. R. Sensitization program mode

Default test parameters may be programmed for the system A.R. SENSITIZATION test.

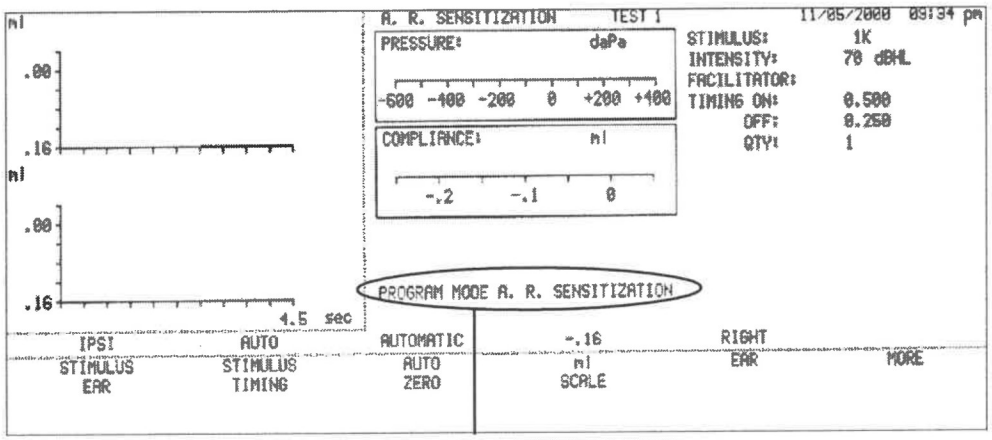
The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

Press the SPECIAL hardkey, then press the RETURN hardkey to display the Special sub-menu.



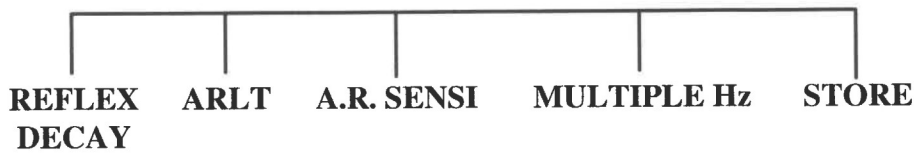
Pressing the PROGRAM MODE softkey places the instrument in the Program Mode and provides access to programming functions for setting overall instrument defaults. Tests can not be performed in the Program Mode. Pressing the PROGRAM MODE softkey displays the PROGRAM MODE message in the status area of the screen.

Once the system is in the Program Mode, press the A.R. SENSI softkey to display the A.R. SENSI menu across the bottom of the screen. The PROGRAM MODE A.R. SENSITIZATION status message will shown in the status area of the screen.

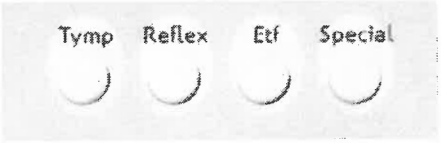


System in PROGRAM MODE

Test parameters can now be selected from the usual softkey menu as done in preparation for a test. Once all the test parameters have been selected, pressing the RETURN hardkey returns the display to the PROGRAM MODE sub-menu.



Pressing the STORE softkey stores the selected parameters as defaults for future tests. The STORING DATA status message will be displayed. Press the A.R. SENSI (or other test mode) softkey to return from the Program Mode to the A.R. Sensitization test mode with the new test parameter defaults.



Tympanometry performed with a probe tone frequency of 226 Hz provides useful clinical information regarding disorders of the tympanic membrane and the Eusta-

Multiple Hz-Special test mode

chian tube. The middle-ear system is mainly stiffness - controlled when tympanometry is performed with low frequency probe tones. Ossicular abnormalities affecting the mass-controlled components cause changes in the transmission characteristics of the tympano-ossicular system which are more easily identified with probe tone frequencies that approximate or exceed the resonance frequency of the ear.

It has been demonstrated that as the probe frequency increases, Susceptance (or the reactance component of admittance) progresses from positive values toward zero. The middle-ear system becomes less stiffness-dominated and more mass-controlled. Resonance of the system is reached when stiffness and mass components are equal in magnitude.

Tympanometric shapes progress through a series of patterns and become more complex as the probe tone frequency increases. Three patterns can be identified as follows:

1) Low Frequency Probe Tones (Below resonance frequency):
   An inverted "V" shape with a single peak appearing at peak pressure.
2) Mid-Range Frequencies (The region of resonance frequencies):
   Multi-peaks (notching) appear and gradually evolve into an inverted W shape.

NOTE

Studies with normal subjects indicate a resonance frequency range of 600 Hz to 1340 Hz with a mean of approximately 1000 Hz (Colletti, 1977), or 800 Hz to 1200 Hz (Shanks, 1984).

3) High Frequency Probe Tones (Above resonance frequency):
   A "V" shape with a single peak appearing at peak pressure - an inversion of the low frequency tympanogram.

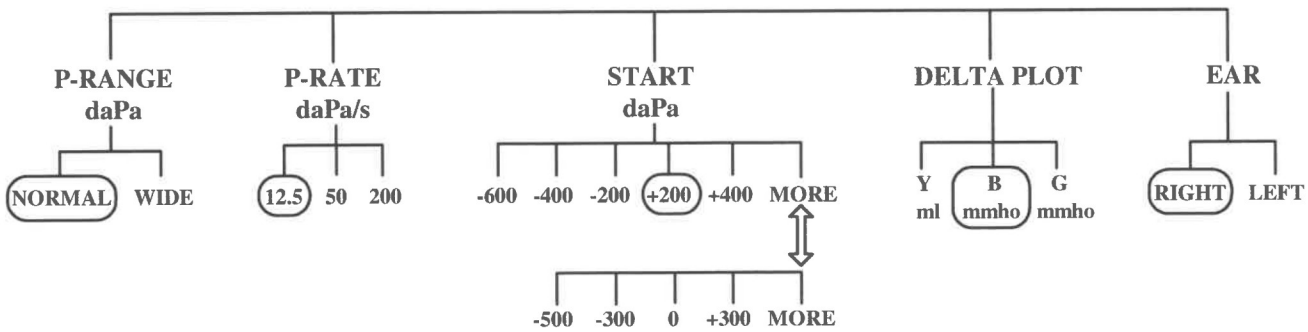
Identifying the frequency region at which these characteristic tympanometric patterns appear offers a sensitive diagnostic tool for differentiating pathological conditions of the middle-ear. The frequency values at which notching of the tympanogram appears is shifted towards higher frequencies for ossicular fixations. There may be some overlap with normal ranges. Multifrequency investigations reveal a shifting towards lower frequencies for post-stapedectomized ears and ossicular discontinuities. Little or no overlap exists between multiple frequency patterns for ossicular fixations and interruptions.

The TympStar Version 2 provides the capability to perform a series of Multiple Frequency tests in an automated sequence. All previous test data should be CLEARED from memory prior to commencing the Multiple Hz test. This will allow the availability of 26 pages of memory for test data storage. The operator may select "Y", "B", or "G" as the admittance component. ("B" is the default parameter)

The probe tone automatically sweeps in frequency from 250 Hz to 2000 Hz in 50 Hz steps at the Start-Pressure. Component and phase measurements are stored in memory. The first tympanogram plotted (test screen 1 of the series) is run at "Y", 226 Hz regardless of operator's component selection. Peak data is identified. A second probe tone sweep occurs at peak pressure. Component and phase measurements are stored in memory as before. The change in component values (ΔY, or ΔB, or ΔG) and phase values ($\Delta\theta$) between the first sweep of frequencies and the second sweep are calculated and plotted on graphic displays as a function of frequency (250 Hz to 2000 Hz). This is displayed as test screen 2 of the series. The resonance frequency of the test ear is automatically identified by the cursor on the graphic displays. The operator may then elect to run a tympanogram at this resonance frequency (test screen 3 of the series) to identify notching patterns. Subsequent tymps may be run at operator selected probe tone frequencies below and above resonance in 50 Hz steps to observe characteristic shapes. The Δ display (test screen 2 of the series) may be viewed during the test sequence for referencing the last probe test frequency selected.

The structure of softkey menu selections are diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

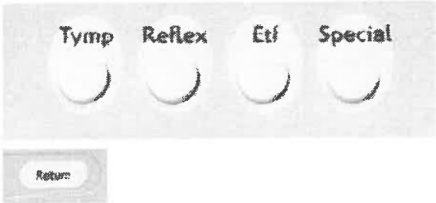
Softkey menu structure



1) Press the SPECIAL hardkey and then the RETURN hardkey to display the SPECIAL menu across the bottom of the LCD.

Multiple Hz test procedure

2) Press the MULTIPLE Hz softkey to place the instrument in the MULTIPLE Hz test mode and display the MULTIPLE Hz softkey menu.

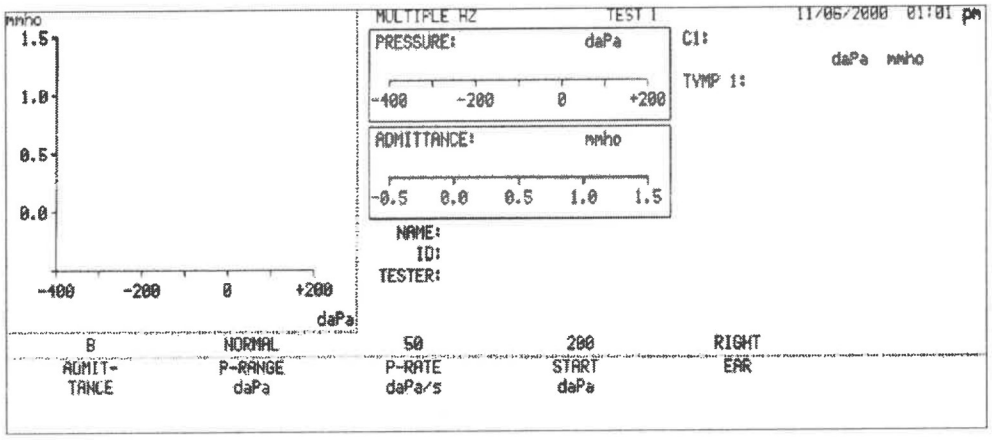


3) Upon selecting the MULTIPLE Hz mode, default test parameters to begin the test series are displayed above softkeys across the bottom of the LCD. Test parameters may be modified as previously described in chapter 1.

NOTE
It may be helpful to select a sweep rate of 12.5 daPa/sec for sharply sloped tymps.

NOTE

4) The first tympanogram seen in the Multi-Hz mode is 226 Hz, Y so that the GSI TympStar can automatically determine the peak pressure value. This parameter cannot be modified by the operator. The baseline is set to OFF

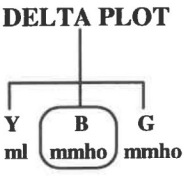


throughout the multi-Hz test sequence. The softkey setting for DELTA PLOT determines the component data collected during the frequency sweeps at the START daPa and peak daPa.

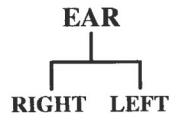
NOTE
B is the best component for this portion of the test.

NOTE

5) Press the EAR softkey to toggle between the right and left ear, then if desired, navigate through the MULTIPLE Hz softkey menu and change parameter settings for the test

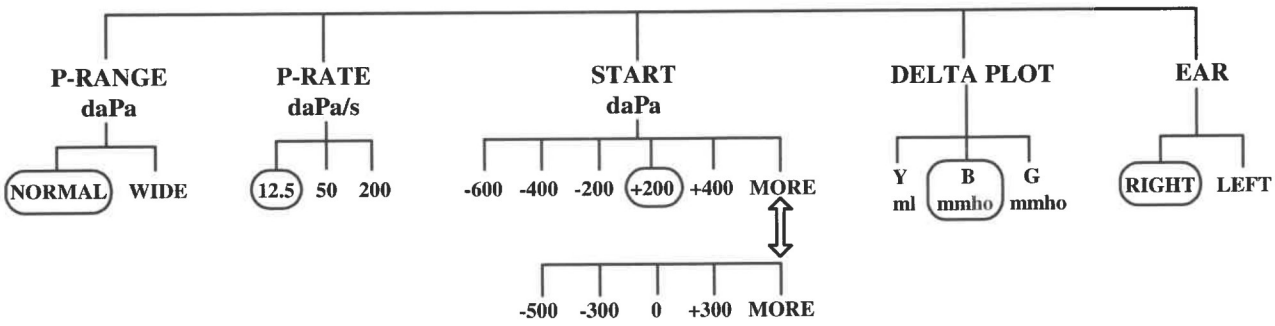


as required. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

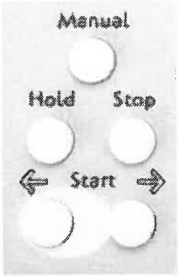


6) Ensure that the ear canal is securely sealed with probe eartip.

7) Press START hardkey to pressurize ear



canal to selected START daPa pressure and to initiate the automatic probe tone sweep from 250 Hz to 2000 Hz in 50 Hz ⇐ ⇒



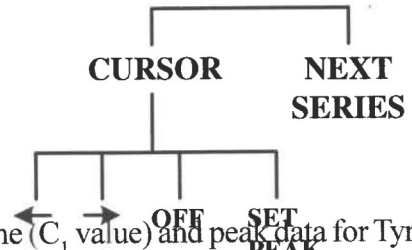
- Susceptance "B" (or "Y" or "G" values if selected) and phase "θ" data measured at start pressure are recorded in memory at each 50 Hz step.

- The pressure sweep commences and "Y", 226 Hz. Tymp data is collected and displayed as TEST 1 of the series.

- HOLD is automatically entered at the end of the sweep (at -400 daPa). The ear canal is vented. The HOLD hardkey may be pressed prior to completion of the sweep indicating the end of tymp data collection.

NOTE

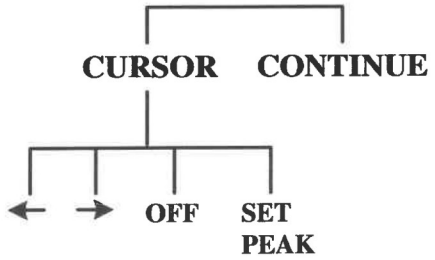
NOTE
If the STOP hardkey is pressed, or if a leak or occlusion occurs during TEST 1 or TEST 2, the test series is aborted. The following softkey choices are displayed:



- Ear canal volume (C_1 value) and peak data for Tymp 1 are displayed to the right of the meter area. Use the CURSOR if a different peak

pressure value is desired.

8) Upon pressing the CONTINUE softkey, axes for the graphs of TEST 2 of



the series are displayed. The ear canal is pressurized to peak pressure. The probe tone automatically sweeps from 250 Hz to 2000 Hz in 50 Hz steps.

- "B" (or "Y" or "G") values and phase "θ" data measured at peak pressure are recorded in memory at each 50 Hz step.

- ΔB (or ΔY or ΔG) values are calculated and plotted as a function of frequency (250 Hz to 2000 Hz) on the upper graph displayed.

- Changes in the phase of admittance (Δθ) as a function of frequency (250 Hz to 2000 Hz) are calculated and plotted on the lower graph.

NOTE

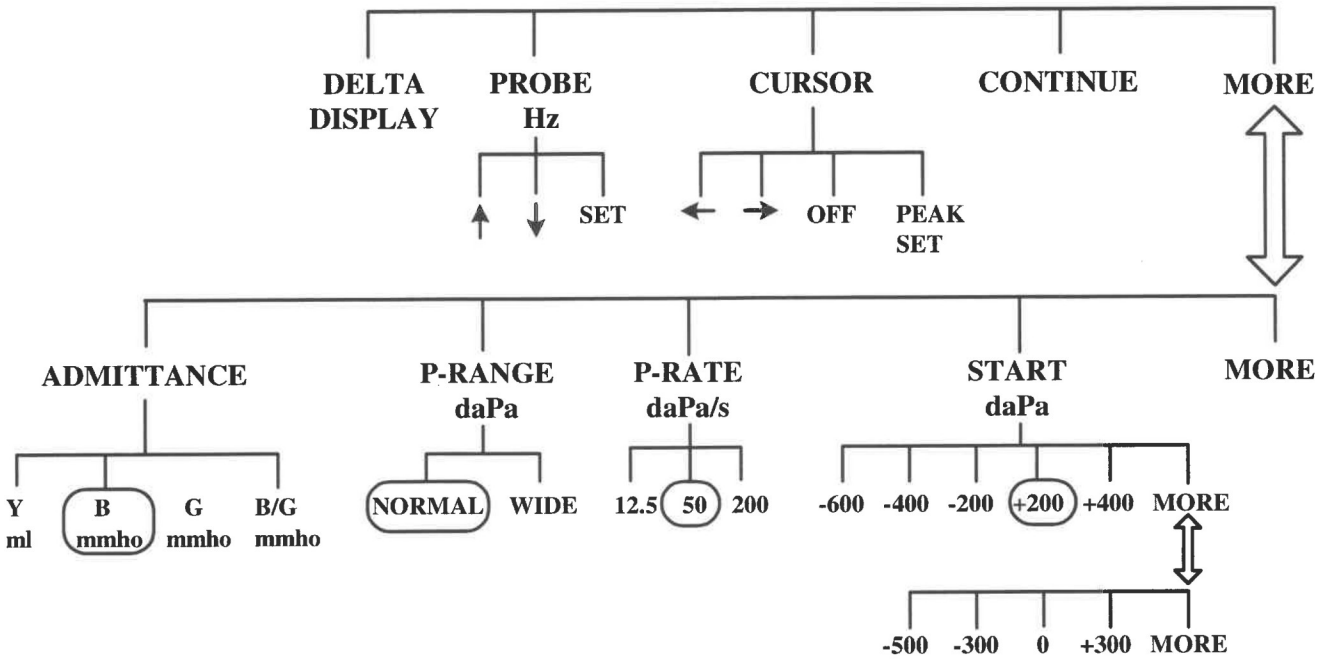
ΔY, ΔB or ΔG values and Δθ values are calculated as the difference between values obtained at peak pressure versus Start-Pressure.

9) A cursor line approximates the calculated resonance point of the ear along the Hz (frequency) axis.
   - The CURSOR softkeys can be used to specify a different Hz point for ΔY, ΔB or ΔG and Δθ. The SET HZ (PROBE Hz) softkey must be used to record the new Hz value.

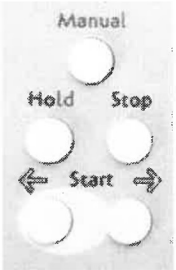
   - When the CURSOR softkey is not used to set the probe Hz for the next tymp, the cursor position prior to pressing the CONTINUE softkey determines the probe frequency for next tymp.

   - Upon pressing the CONTINUE softkey, the tymp format for TEST 3 of the series is displayed with the following softkey menu:

10) The PROBE Hz specified by the cursor in the previous test is displayed to the right of the meter area. Pressing the



CONTINUE softkey or START hardkey initiates the pressure sweep. Tymp data is obtained and displayed on the screen for this probe Hz.



11) Use the CURSOR softkeys to specify and set the peak admittance and pressure. Peak data is summarized to the right of the meter area.

12) If a leak or occlusion occurs during TEST 3, or any subsequent test of the series, the CONTINUE softkey or START hardkey can be pressed to resume testing.

13) Tymps may be obtained for frequencies below and above the identified resonance point of the ear by utilizing the following testing options:
   - Press the PROBE Hz softkey. Use the arrows to arrive at desired Hz. Press the SET Hz softkey to set next probe Hz for tymp test. Pressing the CONTINUE softkey or START hardkey initiates the pressure sweep. Tymp data is obtained and displayed for this probe Hz. The CURSOR softkeys may be used as described earlier.

   - Select the DELTA DISPLAY softkey to return to the Δ Admittance/ $\Delta\theta$ screen. The cursor line indicates the probe frequency from the last tymp. Use the CURSOR keys to select a new probe tone frequency. Press the CONTINUE softkey to EXIT this screen . Then the START hardkey or the CONTINUE softkey on the next screen may be used to begin next tymp.
   - The above test sequences may be repeated until all 26 pages of memory are filled.

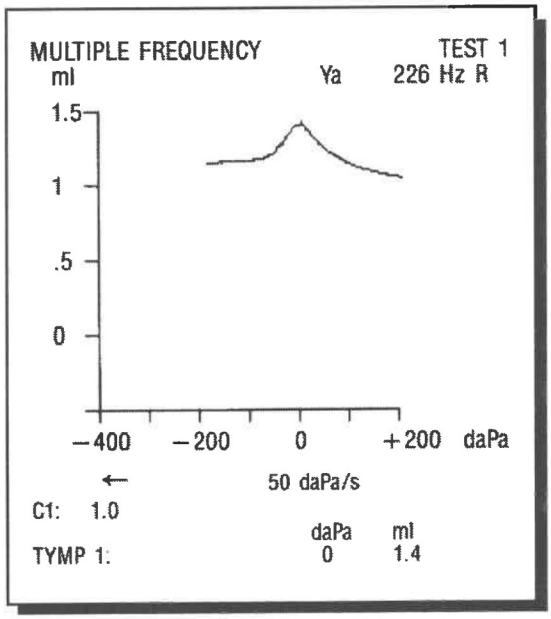
14) Press the STOP hardkey to terminate testing and store the test data.

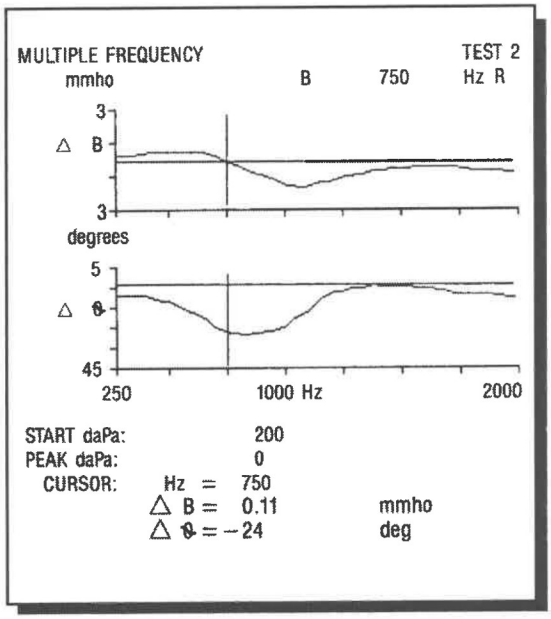
15) Test data can be erased or cleared using the ERASE or CLEAR hardkey on the LCD panel. Please refer to Erasing and clearing test data earlier in this chapter.

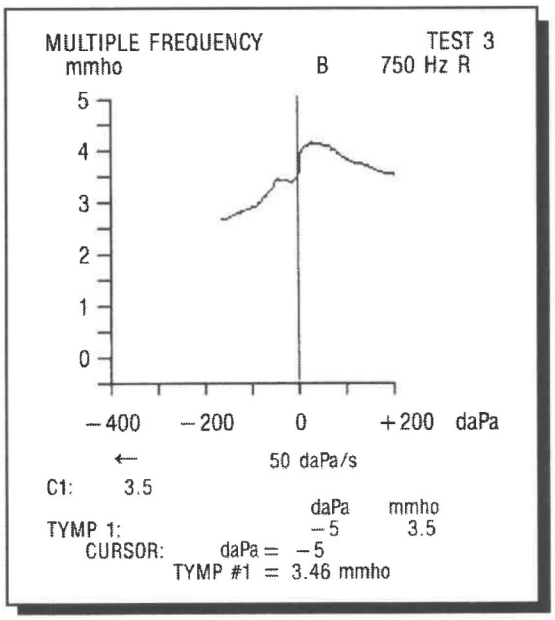
16) Test data can be recalled by PAGING through the test screens. Please refer to Paging test data and the cursor earlier in this chapter.

17) The test data is automatically stored at the completion of the test and may be printed by pressing the PRINT hardkey after selecting the test number using the PAGE hardkey.

Multiple Hz sample printouts





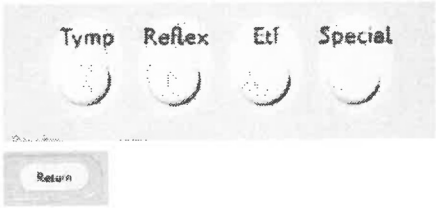


Default test parameters may be programmed for the system MULTIPLE Hz tests.

Multiple Hz Program Mode

The structure of softkey menu selections is diagrammed below. Please refer to Chapter 1: Introduction for instructions regarding navigating through softkey menus and changing parameter settings.

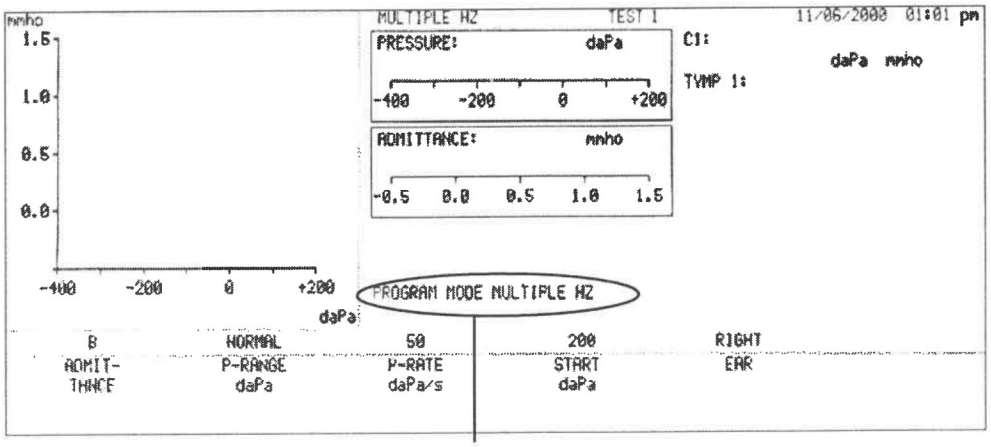
Press the SPECIAL hardkey, then press the RETURN hardkey to display the Special sub-menu.



Pressing the PROGRAM MODE softkey places the instrument in the Program Mode and provides access to programming func-

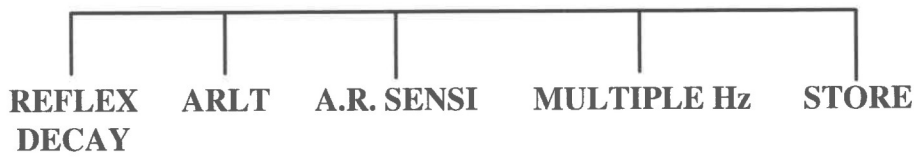
tions for setting overall instrument defaults. Tests can not be performed in the Program Mode. Pressing the PROGRAM MODE softkey displays the PROGRAM MODE message in the status area of the screen.

Once the system is in the Program Mode, press the MULTIPLE Hz softkey to display the MULTIPLE Hz menu across the bottom of the screen. The PROGRAM MODE MULTIPLE Hz status message will be shown in the status area of the screen.
Test parameters can now be selected from the usual softkey menu as done in preparation for a test. Once all the test parameters have been selected, pressing the RETURN hardkey returns the display to the PROGRAM MODE sub-menu.

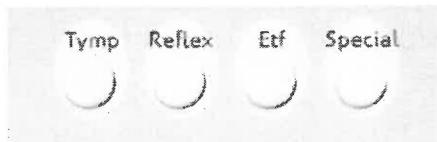


System in PROGRAM MODE

Pressing the STORE softkey stores the selected parameters as defaults for future tests. The STORING DATA status message will be displayed. Press the MULTIPLE Hz softkey to return from the Program Mode to the Multi-Hz test



mode with the new test parameter defaults.



The GSI TympStar is calibrated at our factory where the altitude is very close to sea level. When the TympStar is installed at higher altitudes, the test cavity readings will be higher than their nominal values due to the differences in the density of air from site to site. Refer to the following table for expected changes in cavity values based upon altitude.

Altitude Calibration Mode

NOTE

Day-to-day variations in barometric pressure will have no significant effect on these readings.

	Altitude in Feet								
Cavity size	**0**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
0.5 ml	0.5	0.53	0.55	0.58	0.60	0.63	0.65	0.68	0.70
2.0 ml	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8

NOTE

If you are located at altitudes higher than sea level but you wish to have your test cavities read as if you are at sea level, (i.e. read the nominal value of 0.5 ml and 2.0 ml), it will be necessary to perform the Altitude Calibration prior to using the TympStar.

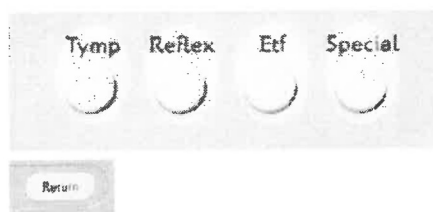
When to use Altitude Calibration

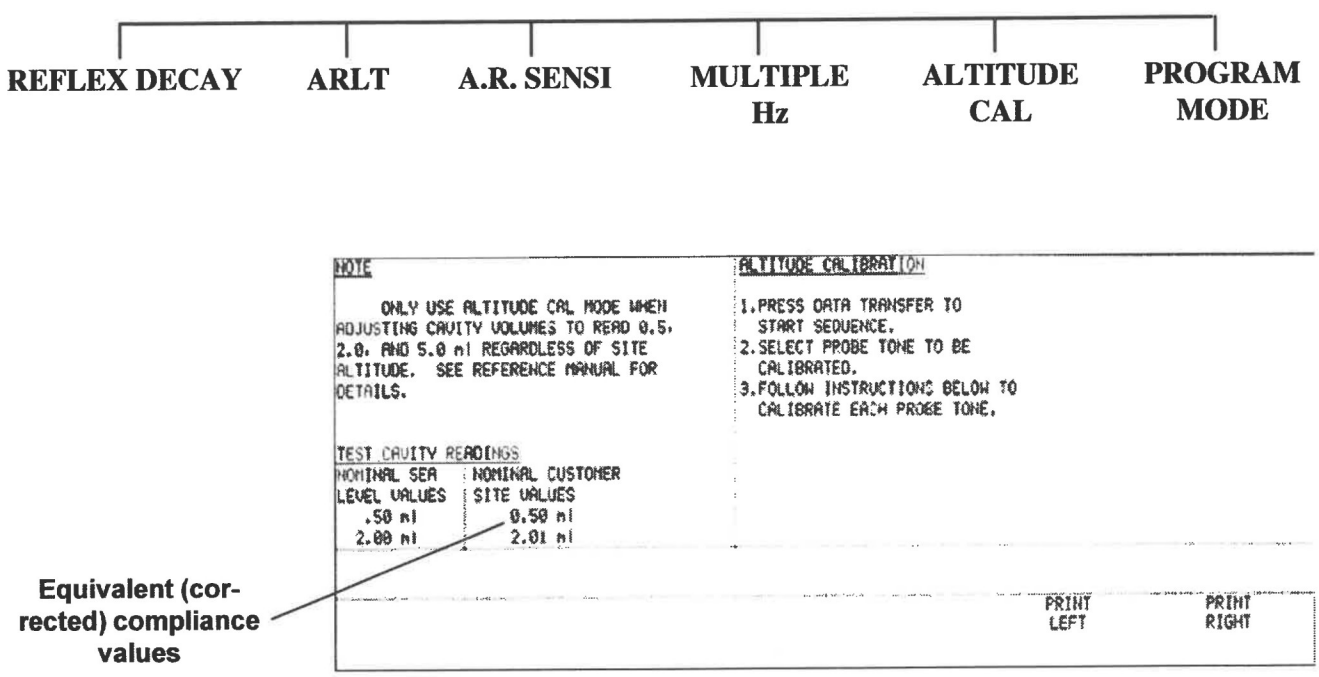
If you are located at altitudes higher than sea level and want to have the test cavity readings reflect the differences in the density of air, do not perform the Altitude Calibration.

Calibration procedure

1) Press the SPECIAL hardkey then the RETURN hardkey to display the Special softkey menu.

2) Press the ALTITUDE CAL softkey to place the instrument in the Altitude Calibration test mode and display the ALTITUDE CALIBRATION screen.





4) Press the DATA TRANSFER hardkey to start the sequence. Follow the directions provided on the right side of the screen and in the message line for calibrating the selected probe tones. The directions will sequence through the necessary tones to complete the calibration.
5) Press 226 Hz.

6) Put the probe into the 2.0 ml cavity as directed on screen.

```
                                        ALTITUDE CALIBRATION

                                        1.PRESS DATA TRANSFER TO
                                          START SEQUENCE.
                                        2.SELECT PROBE TONE TO BE
                                          CALIBRATED.
                                        3.FOLLOW INSTRUCTIONS BELOW TO
                                          CALIBRATE EACH PROBE TONE.

ALTITUDE  CHANGED - DO V/B/G CAL AT 226 678 1000 MULT Hz

      226 Hz          678 Hz          1000 Hz          MULT Hz
```

7) Press the DATA TRANSFER hardkey to begin calibration. Wait for calibration complete notification before proceeding to next step.

8) Press 678 Hz

9) Put the probe into the 2.0 ml cavity as directed on screen.

10) Press the DATA TRANSFER hardkey to begin calibration. Wait for calibration complete notification before proceeding to next step.

11) Press 1000 Hz

12) Put the probe into the HF cavity as directed on screen.

13) Press the DATA TRANSFER hardkey to begin calibration. Wait for calibration complete notification before proceeding to next step.

14) Press MULTI Hz

15) Put the probe into the 2.0 ml cavity as directed on screen.

16) Press the DATA TRANSFER hardkey to begin calibration. Calibration will begin at 250 Hz and increase in 50 Hz increments to 650 Hz. Wait for calibration complete notification before proceeding to next step.

17) Put the probe into the HF cavity as directed on screen.

18) Press the DATA TRANSFER hardkey to begin calibration. Calibration will begin at 650 Hz and increase in 50 Hz increments to 2000 Hz. Wait for calibration complete notification before proceeding to next step.

19) Press the RETURN hardkey to exit Altitude Calibration mode.

Auto Sequence testing

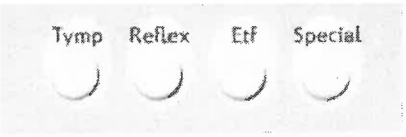
The Auto Sequence function conducts a pre-defined sequence of tests when the AUTO SEQUENCE softkey is pressed. The sequence of tests always includes Tymp Diagnostic at 266 Hz, Y, and can be configured by the user to also include Reflex Threshold and Reflex Decay tests.

NOTE
Auto Sequence testing is useful when conducting an abbreviated battery of middle-ear tests on a cooperative patient. When testing less than cooperative patients, it is best to use the regular Tymp Diagnostic, Reflex Threshold and Reflex Decay test modes to obtain more reliable test results.

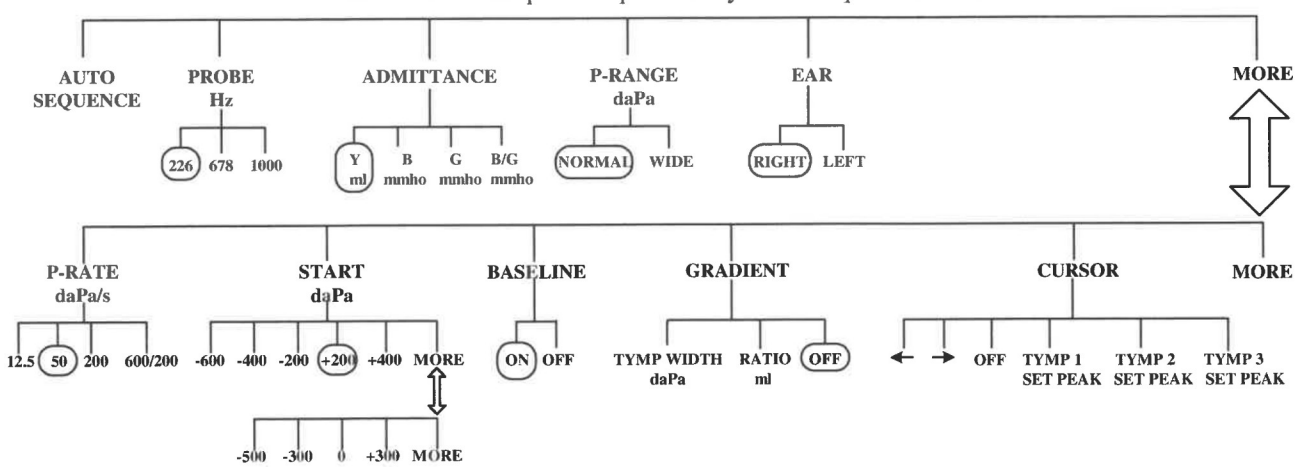
The test sequence for reflex tests is defined under Instrument Options-Test Sequence. The parameters used for Tympanometry Reflex Threshold and Decay tests are those programmed as defaults within each test mode.

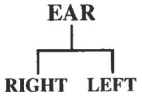
Auto Sequence test procedure

1) Press the TYMP hardkey to place the instrument in the Tymp Diagnostic mode and display the Tymp Diagnostic softkey menu.



2) Press the EAR softkey to toggle between the right and left ear, then insert the probe tip securely into the patient's ear.





3) Press the AUTO SEQUENCE softkey. The sequence of tests will begin with a tympanogram at 226 Hz, Y. If previously programmed as part of the sequence, the sequence will automatically continue to include a Reflex Threshold and Reflex Decay tests.

The reflex threshold sequence is automated by using the default parameters for

Threshold Seek and Auto Timing. Refer to the Reflex Threshold section of this chapter for instructions for setting the minimum compliance change and intensity range values used to arrive at threshold for each stimulus. All ipsilateral stimuli are tested from low to high frequency. Contralateral stimuli are then tested from low to high frequency.

NOTE

If the STOP dBHL setting under Threshold Seek exceeds the maximum available intensity level for a stimulus, the stimulus presentation will stop at this maximum level.

If reflex decay stimuli have been selected in the TEST SEQUENCE sub-menu, the intensity level for each stimulus is automatically presented at 10 dB above the threshold level obtained during the reflex threshold test sequence described above.

NOTE

Reflex threshold testing must be performed prior to reflex decay testing. The stimuli available for Reflex Decay testing are dependent upon the stimuli selected for Reflex Threshold testing.

4) The test sequence will automatically terminate upon completion. The test data is automatically stored. The results can be reviewed by pressing the PAGE hardkey and then can be printed by pressing the PRINT hardkey. Please refer to Paging test data and the cursor earlier in this chapter.

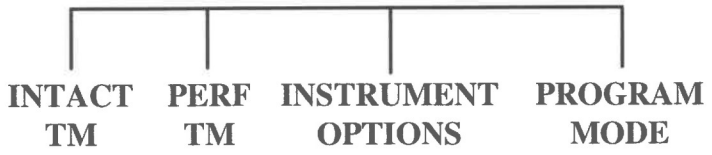
5) Test data can be cleared using the CLEAR hardkey on the LCD panel. Please refer to Clearing test data earlier in this chapter.

Reflex Threshold and Reflex Decay tests can be programmed to be included in the

Auto Sequence program mode

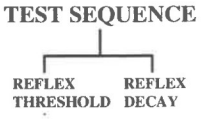
Auto Sequence of tests as follows:

1) Press the ETF hardkey, then press the RETURN hardkey to display the ETF sub-menu.
2) Press the INSTRUMENT OPTIONS softkey to place the instrument in the

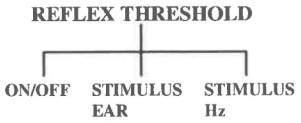


Instrument Options programming mode and display the Instrument Options softkey menu.

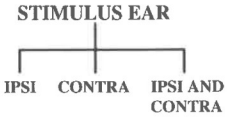
3) Press the TEST SEQUENCE softkey to display the choices for Auto Sequence tests.



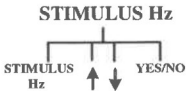
4) Press the REFLEX THRESHOLD softkey to include reflex threshold testing in the Auto Sequence.



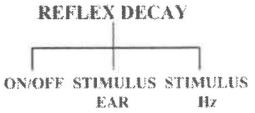
5) Press the STIMULUS EAR softkey to select IPSI ONLY, CONTRA ONLY, or IPSI AND CONTRA for reflex testing.



6) Press the STIMULUS HZ softkey to select the stimuli to be included in the Reflex Threshold Auto Sequence. Scroll through each stimulus and toggle the YES/NO softkey to program it as a stimulus for the test sequence. Press the RETURN hardkey and toggle the ON/OFF softkey to turn Reflex Threshold on.



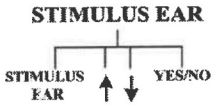
7) Press the REFLEX DECAY softkey to include Reflex Decay testing in the Auto Sequence. The STIMULUS EAR softkey is used to select the stimulus ear for Reflex Decay as IPSI, CONTRA, or IPSI and CONTRA.



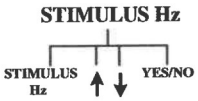
NOTE
Only the STIMULUS EAR(s) and STIMULUS HZ selected under Reflex Threshold are available for selection in Reflex Decay.

8) Use the up and down arrows to display the stimulus ear(s) selected in Reflex

Threshold that will receive stimulus. Toggle the YES/NO softkey to select or deselect the displayed stimulus ear.



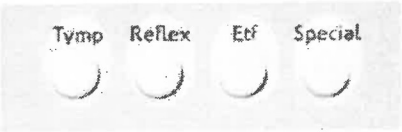
9) The STIMULUS HZ softkey controls the programming of stimuli for decay testing. Use the up and down arrows to scroll through the available stimuli. Toggle the YES/NO softkey to select or deselect the stimulus. Press the RETURN hardkey and toggle the ON/OFF softkey to ON.



NOTE

It is not possible to run Reflex Decay tests without running Reflex Threshold tests.

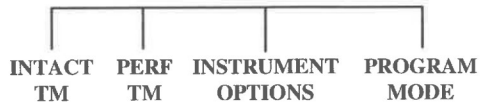
10) Press the RETURN softkey, then press STORE to store the test sequence configuration. Press any test mode hardkey to return from the Instrument Options menu.



Instrument Options

The Instrument Options softkey menu can be used to configure a variety of printing, communication, language, test sequence, date and time and other instrument parameters.

To review or reprogram these instrument options, press the ETF hardkey, then the RETURN hardkey. The following sub-menu will be displayed.
Press the INSTRUMENT OPTIONS softkey to display the Instrument Options

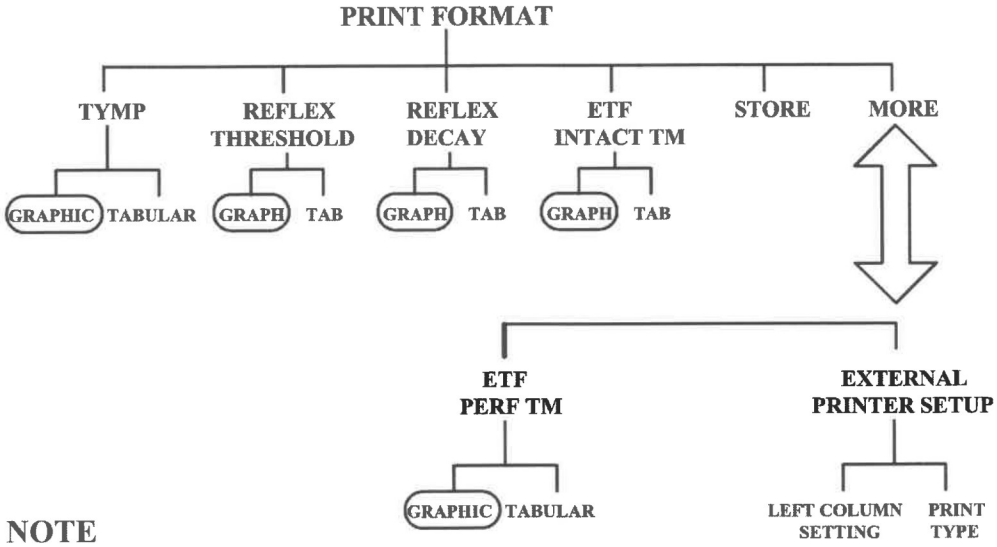


Softkey menu structure

menu. The software menu structure is shown in full on the next page.

Print format

Test results can be printed for each test type in graphic format showing the test tracing, or as a table of numeric values. Press GRAPHIC for printed waveform tracings. Press TABULAR for printed numeric tables. When all the formatting selections have been made, press STORE to store the formatting selections and return to the Instrument Options softkey menu.

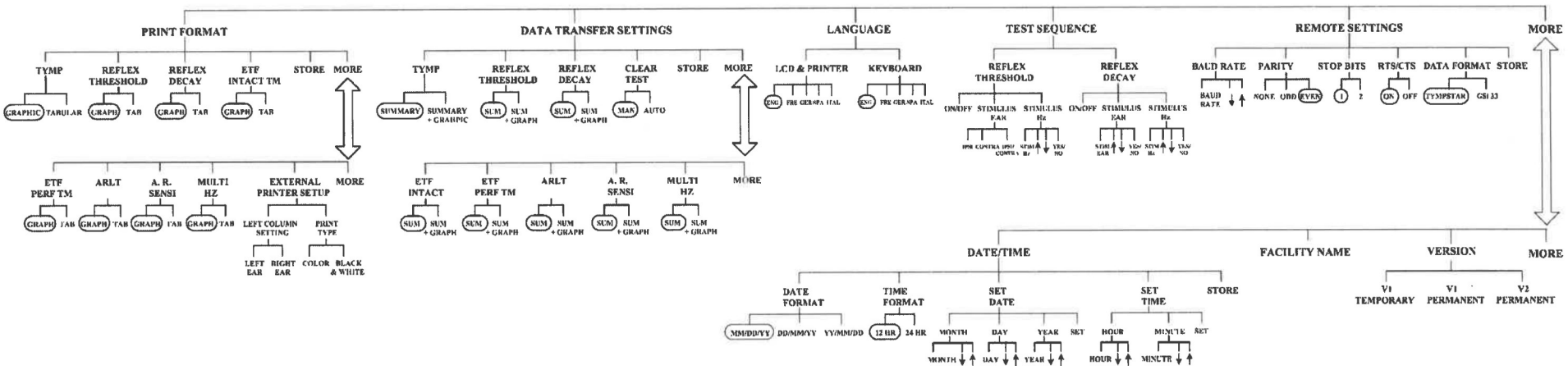


NOTE

When the tabular format is selected for printing Reflex Threshold results, the operator must indicate which tracing on the display represents the threshold value per frequency tested. This is accomplished using the Mark Threshold command.

Alternatively, when Threshold Seek is used with the tabular print format, the GSI TympStar will automatically enter the threshold data in the table.

Press the EXTERNAL PRINTER SETUP softkey. The LEFT COLUMN SET-



Instrument Options software menu structure

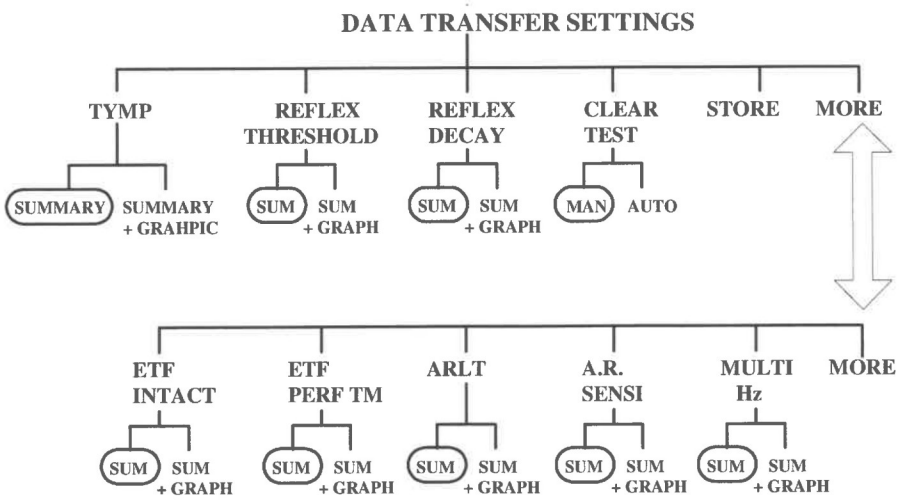
TING softkey is used to select left or right ear data for printing in the left column of the printout. The PRINT TYPE setting is used to select color or black and white printouts.

NOTE
When using a black and white HP LaserJet® printer, the BLACK + WHITE setting must be used.

Data Transfer Settings

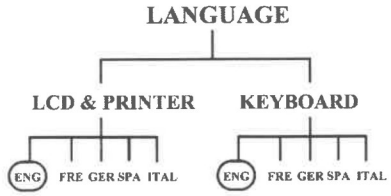
Test result data for each test type can be transferred to a computer over the RS232 serial communications port in the form of a numeric summary or a numeric summary and graphic data. Press SUMMARY for numeric summary transfers. Press SUMMARY + GRAPHIC for transfers of numeric summaries and graphic data. When all the setting selections have been made, press STORE to store the selections and return to the Instrument Options softkey menu. The "STORING DATA" message will appear on the screen above the softkey labels.

The language displayed on the screen , printed on reports and provided for key-



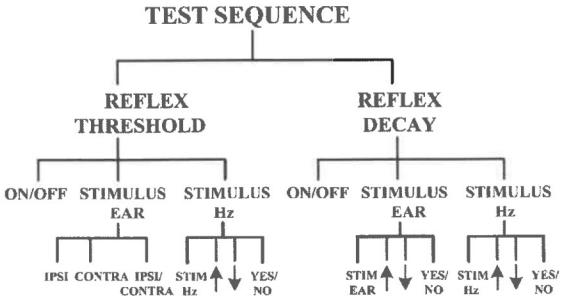
Language

board interaction can be English, French, German, Spanish or Italian.



Test Sequence

The Auto Sequence function conducts a pre-defined sequence of tests when the AUTO SEQUENCE softkey is pressed. The sequence of tests always includes Tymp Diagnostic at 226Hz Y, and can be configured by the user to also include Reflex Threshold and Reflex Decay testing as well. Press REFLEX THRESHOLD and then ON to include Reflex Threshold testing.

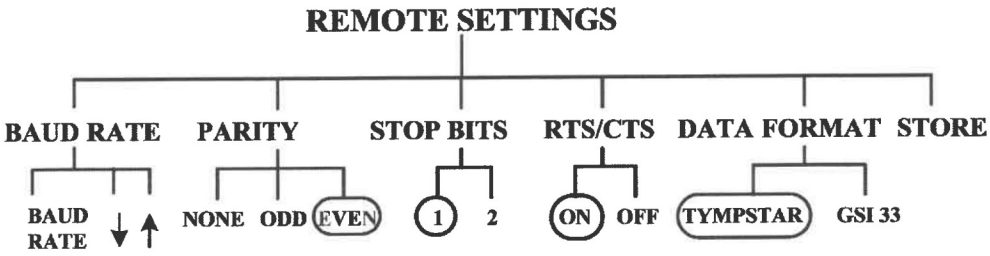


Press REFLEX DECAY and then ON to include Reflex Decay testing. Press STORE to store the configurations and return to the Instrument Options softkey menu.

NOTE
Refer to the Auto Sequence Program Mode for details regarding programming this feature.

Remote Settings

Communication settings for the RS232 serial port are configured using the Remote Settings softkey menu functions. Press the desired parameter softkey and select the required Baud rate, Parity, Stop bits, RTS/CTS configuration and Data Format.
The following baud rates are available and can be scrolled using the up or down arrows:



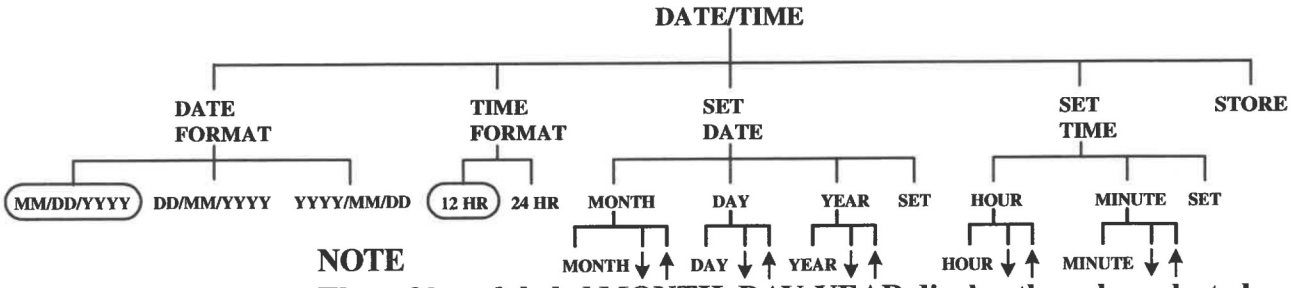
300, 600, 1200, 2400, 4800, 9600, 19200

Data can be communicated in GSI TympStar or GSI 33 formats. Selecting the GSI 33 format transmits data to the serial output in a format identical to that of the GSI 33. Refer to Appendix D: Remote Specifications for details.

Press STORE to store the configurations and return to the Instrument Options softkey menu.

Date and Time

The date and time formats and settings displayed on the screen and on printed reports are configured using the Date/Time softkey menu. Press the desired DATE and TIME formatting softkeys and use the up and down arrows to set the DATE and TIME. Press the STORE softkey to store the configurations and return to the Instrument Options softkey menu.



NOTE
The softkeys labeled MONTH, DAY, YEAR display the value selected us-

NOTE

ing the up and down arrows. Pressing the MONTH, DAY, YEAR keys will not alter the settings and will result in an "Invalid Selection" message.

NOTE

Be certain to press the STORE softkey prior to returning to the Main Options menu to insure that all data and time settings are saved.

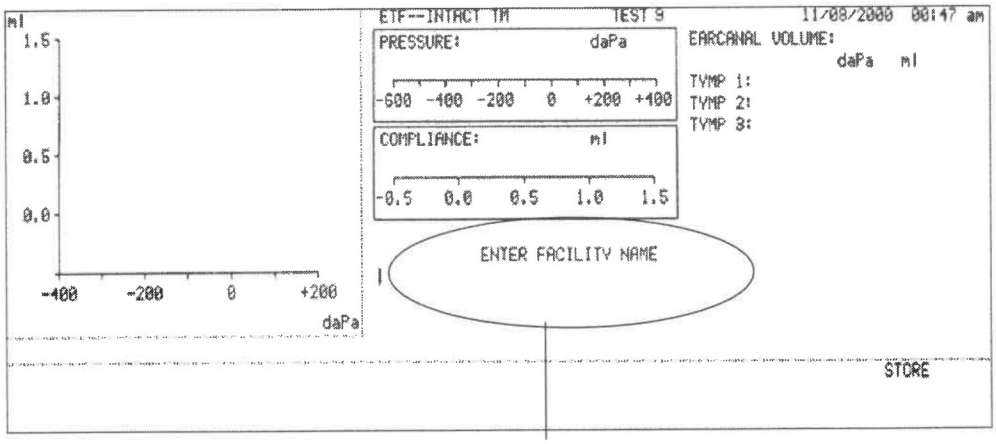
NOTE

Facility Name

The Facility Name softkey menu and an external keyboard can be used to store a facility name that will be displayed on the screen and on printed reports. Press the FACILITY NAME softkey. The screen will display the ENTER FACILITY NAME message and the blinking cursor will show the location of the name that can be entered from the keyboard. Enter the desired header information and press the STORE softkey.

NOTE

The maximum number of characters allowed for a Facility Name is 45.



Facility Name location

NOTE

The Version function provides an easy way for a TympStar Version 2 to be changed to a Version 1 instrument either temporarily or permanently. Version 1 functionality is a limited subset of Version 2 functionality and does not include 678 and 1000 Hz

Version

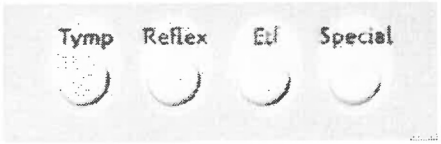
probe tones, multi-frequency tympanometry or ARLT testing.

To change from a TympStar Version 2 to a Version 1:

Changing from a Version 2 to a Version 1

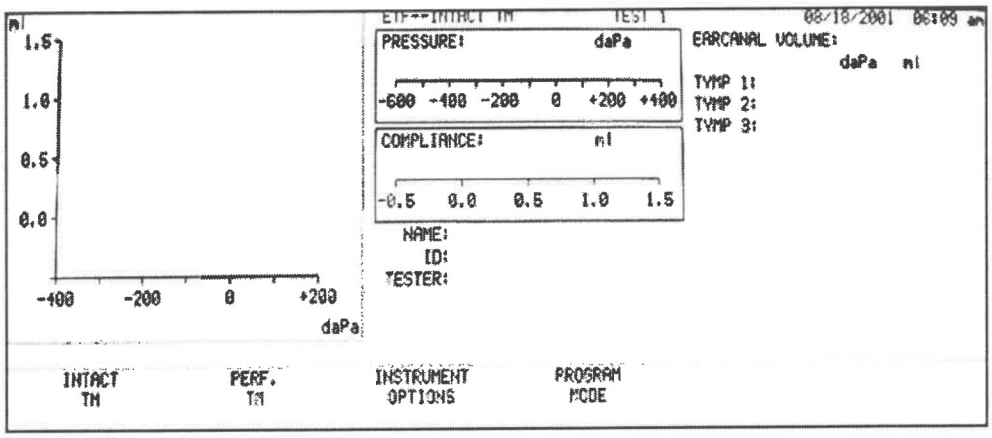
1) Press the ETF hardkey to select the ETF test mode, then press the RETURN hardkey to display the ETF sub-menu.

2) Press the INSTRUMENT OPTIONS softkey, then the MORE softkey to display the VERSION softkey selection.



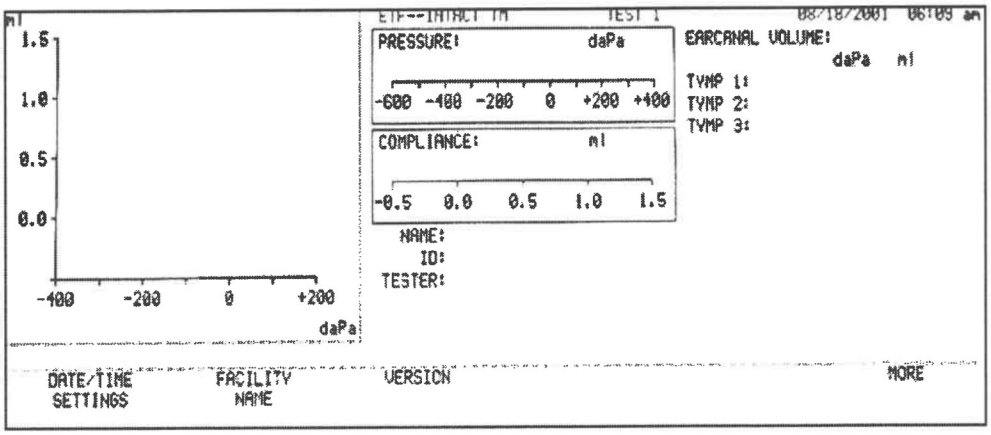
3) Press the VERSION softkey to display

INTACT TM **PERF TM** **INSTRUMENT OPTIONS** **PROGRAM MODE**

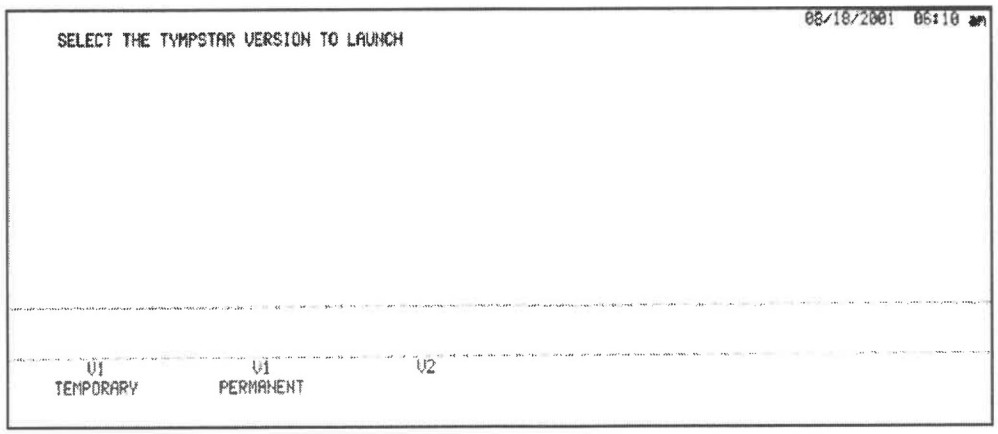


the Version Menu.

NOTE



To return to the Instrument Options menu with no version switching action taken, press the RETURN hardkey from the Version menu.



1) Press the V1 TEMPORARY softkey to change the instrument to V1 functionality temporarily. The message: SWITCHING TO A V1 INSTRUMENT. WAITING FOR WARMSTART will appear. The system will then reboot and reinitialize as a TympStar Version 1.

Switching to V1 temporarily

The V1 Temporary mode allows the instrument to be switched back to V2 mode. The instrument will stay in V1 Temporary mode indefinitely, until changed back to V2 mode as described below.

1) Press the V2 softkey in the Version Menu. Lock and key codes are displayed on the screen.

Switching back to V2

NOTE
Press the CONTINUE softkey from this screen to keep the TympStar in the V1 Temporary mode.

2) Press the DATA TRANSFER hardkey. The message: SWITCHING TO A V2 INSTRUMENT. WAITING FOR WARMSTART will appear. The system will then reboot and reinitialize as a TympStar Version 2.

1) Press the V1 PERMANENT softkey in the Version Menu to change the instrument to V1 functionality permanently. The message: ARE YOU SURE YOU WANT TO CHANGE THIS TO A V1 INSTRUMENT? will appear.

Switching to V1 permanently

CAUTION
Once an instrument is changed to V1 permanently it cannot be changed back to V2 without a license key from Grason-Stadler.

2) Press the YES softkey to switch the TympStar to a V1 instrument permanently. The message: SWITCHING TO A V1 INSTRUMENT. WAITING FOR WARMSTART will appear. The system will then reboot and reinitialize as a TympStar Version 1.

Appendix A

Standards

The GSI TympStar Version 2 meets or exceeds the following standards and specifications for aural acoustic admittance instruments:
IEC 1027 1991-03
ANSI S3.39-1987
ANSI S3.6-1996
ANSI S3.7-1995
IEC 645-1 1992
IEC 126-1973 (also BS 6111-1981)
BS ISO 389-2- 1994

Y2K Compliant
UL 2601-1 Part 1: General Requirements for Safety
CSA C22.2 No. 601.1-M90 (Canada)
CE Mark per Medical Device Directive (93/42/EEC)
0344 VIASYS Healthcare
Welton Road
Warwick
CV34 5PZ
U.K.

EN60601-1:1990 Safety Requirements for Medical Electrical Equipment
EN60601-1-2 Medical Electrical Equipment Emissions and Immunity Requirements

This equipment has been tested for radio frequency emissions and has been verified to meet Radiated and Conducted Emissions per EN 55011-1998, Group 1, Class A and per CISPR, Class A.

Sensitivity ranges

The following admittance measurements give maximum range at standard probe tone frequencies. Compliance "Y", 226 Hz is measured in ml. All other units are in mmhos. (1 acoustic mmho = 10^{-8} $m^{3)}$ /Pa.s)

Table 1: Tymp Mode (Y, B, G)

Frequency	Digital Read-Out Including Cursor	Graphical Display
226 Hz	-7.0 to +7.0	-1.0 to +7.0
678 Hz	-21 to + 21	-5.0 to +25
1000 Hz	-30 to +30	-5.0 to +30

Accuracy:
226Hz: 0.1 ml or 5%, whichever is greater.
Above 226Hz: (F/226) x 0.1 mmho or K% whichever is greater.
K FACTOR: From 250 to 1500 Hz = 5%
Above 1500 Hz =10%

Table 2: Reflex Mode (Y, B, G)

Frequency	Digital Read-Out Including Cursor	Graphical Display
226 Hz	-7.0 to +7.0	-0.16 to +0.80 +0.16 to -0.80
678 Hz	-21 to + 21	-0.48 to +0.80 +0.48 to -0.80
1000 Hz	-30 to +30	-0.64 to +0.80 + 0.64 to -0.80

Accuracy: 226 Hz is 0.02 ml or 5%,whichever is greater.

Temporal Latency in ARLT Mode

Initial Latency Li: < 5 ± 5 msec.
(From signal onset to 10% of Amplitude)
Terminal Latency Lt: < 5 ± 5 msec
(From signal offset to 90% of Amplitude)
Rise Time Tr: <30 ±5 msec.
(From 10% to 90% of Amplitude)
Fall Time Tt: <25 ±5 msec.
(From 90% to 10% of Amplitude)

Multi Frequency

Resonant Frequency Measurement Accuracy: 50 Hz or 5%, Whichever Is Greater

NOTE

NOTE
Resonant frequency is defined as the frequency at which "Delta B " is zero (B is measured at + 200 daPa and at "Peak Pressure").

Probe Signal (Sinusoidal)

Frequencies:
Discrete: 226 Hz, 678 Hz, 1000 Hz
Multi Freq: From 250 Hz to 2000 Hz
Multi Frequency Increment: 50 Hz
Frequency Accuracy:
Discrete and Sweep ±1%
From 250 to 1000 Hz ±1%
Above 1000 Hz ±2%
Harmonic Distortion: <2%
(Measured in an HA-1 2cc Coupler)
Signal Level (In Real Ear and In Normal Test mode):
226 Hz: 85 dB SPL
678 Hz: 80 dB SPL
1000 Hz: 75 dB SPL

NOTE

NOTE
All Probe Tone levels at all frequencies are set to be nominally 70 dB HL.

Signal Level Accuracy:
226 Hz: ±1.5 dB SPL
Other Frequencies: ±3.0 dB SPL

Pneumatic System

Pressure Maximum Limits: -800 daPa to +600 daPa
Programmed Pressure Ranges:
Normal: + 200 to - 400 daPa
Wide: + 400 to - 600 daPa
Pressure Accuracy: ±10% or ±10 daPa, Whichever is greater in cavities from 0.5 cc to 5.0 cc.
Pressure Sweep Rate: 12.5 daPa/sec
50 daPa/sec
600/200 daPa/sec
200 daPa/sec
Manual Sweep Rate Limit: 600 daPa/sec
Sweep Rate Accuracy: ±10%
Pressure System Leak Rate: < 1. 0 daPa/sec
(Measured at -600 and +400 daPa, while pressure servo is disabled.)

Acoustic Reflex Activating (Stimulus) Signal

Pure Tone Stimulus
Frequencies for Contra phone and for Ipsi phone with time multiplexed stimulus. See Table 3.

Frequency Accuracy: ±1%
Total Harmonic Distortion (Acoustically): <2%
(Measured 5 dB HL below guaranteed maximum HL)

Noise Stimulus
The uniformity of the spectrum level of acoustic pressure for the noise signal over 20 averages measured acoustically within their respective band limits will be:
±10 dB for insert or probe type earphones
±5 dB for supra-aural type earphones
Noise Band Widths:
Low Band: 125 -1600 Hz
High Band: 1600 - 4000 Hz
Broad Band: 125 - 4000 Hz (Relative to level at 1 kHz)
Band-edges accurate to within ±15%
Roll off rate: >12 dB/Octave

Stimulus Level Control
Tone Stimulus: The transfer of reference equivalent threshold values are based on the article; "Reference Threshold Levels For The ER-3A Insert Phone", by Laura Ann Wilber, Barbara A. Krueger and Mead C. Killion, J. Acoustic Soc. Am. Suppl. 1, Vol. 81 Spring 1987. GSI determined the transfer data from an IEC 711 coupler to an ANSI HA-1 coupler. Using this data, the reference threshold values were determined for both the Ipsi and Contra insert earphones for calibration in an ANSI HA-1 2cc coupler.

Noise Stimulus: The transfer of reference threshold values was done by GSI using the "Threshold Determination Method". The transfer data from an IEC

711 to an ANSI HA- 1 coupler was determined by GSI.

Intensity levels are reduced as a function of volume at a rate of 1 dB SPL for each .1 ml. Intensity reduction begins at 1.2 ml.

Table 3A: Upper limit of HL range in Reflex Threshold Mode

		Pure Tone Stimulus (Hz)					Noise Stimulus			Other Stimulus	
	Probe Tone	250	500	1000	2000	4000	LBN	HBN	BBN	Click (SPL)	EXT (SPL)
Ipsi Pulsed	226 Hz	95	110	110	105	100	95	95	95	110	110
	678 Hz	95	110	110	105	100	95	95	95	110	110
	1000 Hz	95	110	110	105	100	95	95	95	110	110
Contra Pulsed	226 Hz	110	120	120	120	115	115	115	115	120	120
	678 Hz	110	120	120	120	115	115	115	115	120	120
	1000 Hz	110	120	120	120	115	115	115	115	120	120
Contra Steady	226 Hz	n/a	120	120	120	115	115	115	115	120	120
	678 Hz	110	n/a	120	120	115	115	115	115	120	120
	1000 Hz	110	120	n/a	120	115	115	115	115	120	120

Lower limit of HL range for all stimulus signals (35 dB HL).
Hearing Level Increment: 1.0, 2.0, 5.0 dB
Hearing Level Increment Accuracy: ±0.5 dB
Hearing Level Control Linearity: ±1.0 dB

Table 3B: Upper limit of HL range in ARLT and Reflex Decay Modes

		Stimulus Selections (Hz)					Noise Stimulus			Other Stimulus	
	Probe Tone	250	500	1000	2000	4000	LBN	HBN	BBN	Click (SPL)	EXT (SPL)
Contra	226Hz ①	n/a	120	120	120	115	115	115	115	120	120
	678Hz ②	110	n/a	120	120	115	115	115	115	120	120
Ipsi	226Hz ①	n/a	105	110 ③	105	100	n/a	n/a	n/a	n/a	110
	678Hz ②	90	n/a	110	100	100	n/a	n/a	n/a	n/a	110

①Limits apply for Reflex Decay and ARLT modes.
②Limits apply for Reflex Decay only. ARLT not available at 678 Hz.
③Limits apply for Reflex Decay only. ARLT limit is 105 dB.

TABLE 4: UPPER HL LIMIT IN ACOUSTIC REFLEX SENSITIZATION MODE

C_f Versus I_a

Ipsi Actuator (Hz)	(HL)	Cf (Contra facilitator) 500Hz (dbHL)	1000 (dbHL)	2000 (dbHL)	4000 (dbHL)	6000 (dbHL)	BBN (dbHL)	EXT(SPL) (dbSPL)
500	105	---	120	120	115	115	115	120
1000	110	120	---	120	115	115	115	120
2000	105	120	120	---	115	115	115	120
4000	100	120	120	120	---	115	115	120
EXT	101	120	120	120	115	115	115	120

C_f Versus C_a

Contra Actuator (Hz)	(HL)	Ct (Contra facilitator) 500Hz (dbHL)	1000 (dbHL)	2000 (dbHL)	4000 (dbHL)	6000 (dbHL)	BBN (dbHL)	EXT(SPL) (dbSPL)
500	120	---	120	120	115	115	115	120
1000	120	120	---	120	115	115	115	120
2000	120	120	120	---	115	115	115	120
4000	115	120	120	120	---	115	115	120
BBN	115	120	120	120	115	115	115	120
EXT	120	120	120	120	115	115	115	120

C_f Versus C_a

Contra Actuator (Hz)	(HL)	If (Ipsi facilitator) 500Hz (dbHL)	1000 (dbHL)	2000 (dbHL)	4000 (dbHL)	6000 (dbHL)	EXT(SPL) (dbSPL)
500	120	---	110	105	100	90	110
1000	120	105	---	105	100	90	110
2000	120	105	110	---	100	90	110
4000	115	105	110	105	---	90	110
BBN	115	105	110	105	100	90	110
EXT	120	105	110	105	100	90	110

I_f Versus I_a

Ipsi Actuator (Hz)	(HL)	If (Ipsi facilitator) 500Hz (dbHL)	1000 (dbHL)	2000 (dbHL)	4000 (dbHL)	6000 (dbHL)	EXT(SPL) (dbSPL)
500	105	---	110	105	100	90	110
1000	110	105	---	105	100	90	110
2000	105	105	110	---	100	90	110
4000	100	105	110	105	---	90	110
EXT	110	105	110	105	100	90	110

Click Stimulus

Guaranteed Peak Equivalent SPL Levels:
Ipsi: 110 dB SPL
Contra: 120 dB SPL
Peak hold SPL to peak equivalent SPL transfer data.
(Peak hold SPL = peak equivalent SPL + transfer data)
Ipsi: 8.5 dB
Contra: 5.5 dB
Click Rate Range: 50-300 Pulse/sec.
Click rate accuracy: ±1pulse/sec.
Pulse Width (Electrically Measured): 100 msec.
Pulse Rise/Fall Time (Electrically): 5.0 msec.
Frequency Spectrum:
Ipsi: 50 - 4000 Hz
Contra: 50 - 3600 Hz

NOTE
Frequency spectrum uniformity better than: 10 dB

External Input: At 0.5 VRMS:
1 KHz Upper Limits:
Ipsi: 110 dB SPL
Contra: 120 dB SPL

Stimulus Presentation Control

Signal ON/OFF Ratio: >70 dB
OFF mode signal level: <20 dB SPL
Signal To Noise Ratio: >70 dBA
Measured with disabled probe signal and "A" weighting for noise measurement.
Residual noise: <25 dBA SPL
(Stimulus Present switch in OFF position)
Unwanted Acoustic Probe Signals: <60 dBA
Measured while pump is operating and probe tone is disabled. Measure it with "A" weighted filter in "SLOW" Time mode. The noise in normal operating mode will not effect the immittance measurement accuracy.

Signal separation between Ipsi and Contra channels; all frequencies: >70 dB
(Measured at the probes with the "ON" channel set to 90 dB)
Leaked signal: <20 dB SPL

The radiated acoustic noise from the instrument (with reflex stim off) when measured at 1 meter from the instrument, shall be: <50 dBA
("A" weighting and "SLOW" averaging)

Temporal Specifications Of Stimulus Presentation

Steady State Stimulus
Initial Delay (elapsed time from present bar activation to 10% stimulus amplitude): < 100 msec

Terminal Delay (elapsed time from present bar deactivation to 90% stimulus amplitude): <100 msec
Rise time: 7.5 ± 2.5 msec
Fall time: 7.5 ± 2.5 msec

NOTE

NOTE
Initial and terminal delays do not effect temporal measurement of ARLT test (software compensates for them).

Multiplexed Stimulus *(Used in Reflex Threshold test mode)*

Period data for frequencies: 250 and 500 Hz:

Period	124 msec
Stimulus on time	44 msec
Stimulus off time	62 msec
Rise and fall time	18 msec

Period data for all other frequencies:

Period	115 msec
Stimulus on time	44 msec
Stimulus off time	53 msec
Rise and fall time	18 msec

Temporal Spec. Accuracy: ±10% or 5 msec, whichever is greater

Environmental

The GSI TympStar Version 2 meets ANSI S3.6-1996 Standards for temperature and humidity specifications, and it meets the UL 2601-1, CSA 22.2 and IEC 60601-1 standards for safety.

Temperature:
Storage: -40 degrees C to +75 degrees C
Operating: +15 degrees C to +35 degrees C
Humidity: 90% at 35 degrees C (non-condensing)

Warm-Up Time

At room temperature; +15°C to +35°C: 10 Minutes
At room temperature; below +15°C: 1 Hour

Calibration Stability

All GSI TympStar Version 2 specifications are met over the range of specified power line, temperature and humidity variations.

Power Line:

Voltage Variation: ±10%

Frequency Variation: ± 5%

Power line short term variation which affects the performance of the instrument will turn off all probe and stimulus signals.

Power Rating: 120 Watts maximum

Line Voltage Range: 100 VAC to 240 VAC

Power Line Frequency Range: 50 - 60 Hz

Temperature Operating Range: +15°C to +35°C

Relative Humidity Operating Limit: 90%

Guaranteed Operating Elevation: 6000 Ft. (1800m)

Connectors

STIMULUS: External Stimulus Input

(Phone Jack) Peak Voltage: 3 VAC

Input Impedance: 15,000 Ohms

PRESENT: External Present Control Input that turns the stimulus signal ON and OFF (Phone Jack).

Voltage Range: STIM OFF: +5.0 VDC

STIM ON: 0.0 v

Input Impedance: 11,000 Ohms

Contra PHONE: Output Voltage: 7 VAC

Output Impedance: 2.5 Ohms

Standard 9-pin RS232C serial port for interfacing with outside computer.

Pin	Function	Signal level	Impedance
2	RXD (DCE output)	+/- 8 VDC output	300 Ohm
8	CTS (DCE output)	+/- 8 VDC output	300 Ohm
3	TXD (DCE input)	+/- 30 VDC input	5 KOhm
7	RTS (DCE input)	+/- 30 VDC input	5 KOhm
5	SIG_GND	Signal Ground	0 Ohm
1,4,6,9	Unused		

CTS

Standard VGA port for external monitor.

Pin	Function	Signal level
1	Red	0.7 Vp-p output
2	Green	0.7 Vp-p output
3	Blue	0.7 Vp-p output
5,6,7,8, 10	Ground	Ground
13	Horizontal Sync	5 Vp-p, 30kHz to 80kHz
14	Vertical Sync	5 Vp-p, 55Hz to 90 Hz
4,9,11, 12,15	Unused	

NOTE

A 226 Hz Y tympanogram is displayed on the LCD screen in a 1:1 aspect ratio and on the external VGA monitor in a 1.4:1 aspect ratio. The Pressure (horizontal) axis appears to be "stretched out" by 40% on the VGA monitor.

Standard PS-2 keyboard port for external Keyboard.

Pin	Function	Signal level	Impedance
1	KB data	+ 5 VDC input	5 KOhm
2	MS data	+ 5 VDC input	5 KOhm
3	Ground		0 Ohm
4	Vcc	+ 5 VDC output	5 KOhm
5	KB clock	+ 5 Vp-p, square wave output	50 Ohm
6	MS clock	+ 5 Vp-p square wave output	50 Ohm

Standard parallel printer port for external printer.

Pin	Function	Signal level	Impedance
1	/STROBE	+5 VDC output	45 Ohm
2	D0	+5 VDC output	45 Ohm
3	D1	+5 VDC output	45 Ohm
4	D2	+5 VDC output	45 Ohm
5	D3	+5 VDC output	45 Ohm
6	D4	+5 VDC output	45 Ohm
7	D5	+5 VDC output	45 Ohm
8	D6	+5 VDC output	45 Ohm
9	D7	+5 VDC output	45 Ohm
10	/ACK	+5 VDC input	1.65 KOhm
11	BUSY	+5 VDC input	1.65 KOhm
12	PAPER EMPTY	+5 VDC input	1.65 KOhm
13	SELECT	+5 VDC input	1.65 KOhm
14	/AUTOLF	+5 VDC output	45 Ohm
15	/ERROR	+5 VDC input	1.65 KOhm
16	/INIT	+5 VDC output	45 Ohm
17	/SEL IN	+5 VDC output	45 Ohm
18,19, 20,21,22 23,24,25	Ground	Ground	0 Ohm

Electrical

The following apply to the TympStar system:

1) Class 1 Medical Equipment
2) Type B Medical Equipment
3) IPXO ingress of water (ordinary equipment)
4) Equipment not suitable for use in the presence of flammable anesthetic mixture with air or with oxygen or nitrous oxide.
5) Mode of operation - continuous

Input Voltage: 100 – 240 VAC
Input Frequency: 50 – 60 Hz
Input Current: 3.2 A maximum
Power Consumption: 120W maximum

Supplied Accessories

Contra insert phone	GSI Part # 8000-0078
Calibration cavity (V2)	GSI Part # 2000-1035
Probe cleaning kit (2 boxes)	GSI Part # 2000-9610
Eartips:	
1 pkg. 8 standard sizes, 4 ea. (Color coded)	GSI Part # 1700-9660
1 pkg. 6 special sizes, 2 ea.	GSI Part # 1700-9670
1 pkg. 6 screening sizes, 2 ea.	GSI Part # 1700-9622
Reference Instruction Manual	GSI Part # 2000-0120
Quick User Guide	GSI Part # 2000-0126
Printer paper (2 rolls) for orders including printer	GSI Part # 1738-9619
Spare set of probe tubing	GSI Part # 2000-9617
Probe mount - shoulder	GSI Part # 1700-9646
Probe mount - wrist	GSI Part # 1700-9642
Probe mount - clothes	GSI Part # 1700-9608
Printer paper, adhesive-backed for orders including a printer	GSI Part # 1770-9643
GSI TympStar dustcover	GSI Part # 1700-9618
Power cord with hospital-grade plug	GSI Part # 4204-0251 (USA)

Power cord part # varies depending on location

Mechanical

DIMENSIONS AND WEIGHT

W x D x H: 20.38 inches x 15 inches x 12.6 inches (LCD raised)
52cm x 38cm x 32cm
Height with LCD lowered - 6 inches (15cm)

Weight: 16.58 pounds, 7.53 kg

Shipping weight: 29.50 pounds, 13.38 kg

Materials of manufacture

Top Case, LCD Housing

Front & Rear & Hinges:	Lexan 500 w/10% Glass & 2% Blowing Agent, 94V0 Rated
LCD Lens:	GE HP40S -OR- Duralan II
Switches:	Shincor Shin-Etsu/Novacor KE-951 U
Labels:	Lexan & Polycarbonate
Softkey Panel:	Mylar
Probe Cord:	Polyvinyl Chloride (PVC)
Probe Top & Bottom Housings:	Cycolac KJW, UL 94V0 Rated
Probe Tip:	Polypropolene
Eartips:	Kraton 3226
Tubing:	Vinyl and Polyurethane

Calibration requirements

GSI recommends quarterly calibration checks for the GSI TympStar along with annual certification. ASHA requires quarterly electro-acoustic calibration checks and annual electro-acoustic calibration. It is good practice to perform daily biologic checks. See the Calibration Checks section of Chapter 3 in this manual more information, or Chapter 4: Calibration in the TympStar Service Manual for complete calibration instructions.

Appendix B

Bibliography TympStar Version 2

GENERAL

ANSI S3.39-1987, - "American National Standard Specifications For Instruments To Measure Aural Acoustic Immittance", (ASA 71-1987).

Feldman, A., Wilbur, L., "Acoustic Impedance & Admittance - The Measurement Of Middle Ear Function", Williams and Wilkins, Baltimore, (1976).

IEC 29C - "Int. Electrotech. Comm. Standard For The Measurement Of Aural Acoustic Impedance/ Admittance Instruments".

Katz, J., "Handbook Of Clinical Audiology", (3rd Edition), Williams and Wilkins, Baltimore, (1985).

DIAGNOSTIC TYMPANOMETRY

Alberti, P., Jerger, J., "Probe-Tone Frequency And The Diagnostic Value Of Tympanometry", *Arch. Otolaryngol.,* (1974), 99: 206-210.

Beery, Q., Bluestone, C., Andrus, W., Cantekin, E., "Tympanometric Pattern Classification In Relation To Middle Ear Effusions", *Ann. Otol. Rhinol. And Laryngol.,* (1975), 84 (1): 56.

Chesnutt, B., Stream, R., Love, 1, McLarey, D., "Otoadmittance Measurements In Cases Of Dual Ossicular Disorders", *Arch. Otolaryngol., (1975),* 101: 109-113.

Cooper, J., Hearne, E., Gates, G., "Normal Tympanometric Shape", *EarAnd Hearing,* Williams and Wilkins Co., University of Texas Health Science Center, San Antonio, TX. (1982).

Creten, W., Van de Heyning, P., Van Camp, K., "Immittance Audiometry", *Scand. Audiol.,* (1985),14:115-121.

Creten, W., Van Camp, K., "Transient And Quasi-Static Tympanometry", *Scand. Audiol.,* (1974), 3: 39-42.

Creten, W., Van Camp, K., Maes, M., Vanpeperstraete, P., "The Diagnostic Value Of Phase-Angle Tympanograms," *Audiology,* (1981), 20: 1-14.

Feldman, A., "Impedance Measurements At The Eardrum As An Aid To Diagnosis", *J. Speech And Hear. Res.,* (1963), 6 (4): 315-327.

Feldman, A., "Diagnostic Application And Interpretation Of Tympanometry And The Acoustic Reflex", *Audiol.,* (1977), 16: 294-306.

Hall, J., "Contemporary Tympanometry", *Seminars In Hear.,* (1987), 8 (4): 319-327.

Liden, G., "Impedance Audiometry", Department of Audiology and Otolaryngology, Sahlgren's Hosp., Univ. of Goteborg, Goteborg, Sweden.

Lilly, D., "Measurement Of Acoustic Impedance At The Tympanic Membrane;' *Modem Developments In Audiology,* 2nd Ed., Academic Press, Inc., New York and London: (1973), 345-405.

Margolis, R., Smith, P, "Tympanometric Asymmetry", *J. Speech And Hear.,* (1977), Res. 20: 437-446.

Margolis, R.,"Interactions Among Tympanometric Variables", J. *Speech And Hear., (1977),* Res. 20: 447-462.

Osguthorpe, D., "Effects Of Tympanic Membrane Scars On Tympanometry: A Study In Cats", *Laryngoscope,* (1986), 96: 1366-1377.

Popelka, G., "Acoustic Immittance Measures: Terminology And Instrumentation" *Ear And Hear,* (1984): 262-267.

Porter, T, "Normative Otoadmittance Values For Three Populations", *J. Of Aud..* (1972), Res. Xii (1): 53-58.

Rabinowitz, W., "Measurement Of The Acoustic Input Immittance Of The Human Ear", *J. Acoust. Soc. Am.,* (1981), 70 (4): 1025-1035.

Renvall, U., Liden, G., Jungert, S., "Impedance Audiometry In The Detection Of Secretory Otitis Media", *Scand. Audiol.,* (1975), 4: 1-6.

Shanks, J., Lilly, D., "An Evaluation Of Tympanometric Estimates Of Ear Canal Volume", *J. Speech And Hear.,* (1981), Res. 24: 557-566.

Shanks, J., "Tympanometry", *Ear And Hear.,* (1984), 5 (5): 268-280.

Shurin, P, Pelton, S., Finkelstein, J., "Tympanometry In The Diagnosis Of Middle-ear Effusion", *N. Eng. J. Med.,* (1977), 296: 412-417.

Thompson, D., Sills, J., Recke, K., Bui, D., "Acoustic Admittance And The Aging Ear", *J. Speech And Hear.,* (1979), Res. 22: 29-36.

Van Camp, K., Raman, E., Creten, W., "Two Component Versus Admittance Tympanometry", *Audiol.*, (1974), 15: 120-127.

Van Camp, K., Creten, W., Vanpeperstraete, P, Van de Heyning, P., "Tympanometry - Detection Of Middle Ear Pathologies", *Acta Otolaryngol. Belgica.*, (1979).

Van Camp, K., Vogeleer, M., "A Tympanometric Approach To Otosclerosis", *Scand. Audiol.*, (1986),15:109-114.

Van Camp, K., Creten, W., Van de Heyning, P, Decraemer, W., Vanpeperstraete, P, "A Search For The Most Suitable Immittance Components And Probe Tone Frequency In Tympanometry", *Scand. Audiol.*, (1983), 12: 27-34.

Van de Heyning, P., Van Camp, K., Creten, W., Vanpeperstraete, P, "Incudo-Stapedial Joint Pathology: A Tympanometric Approach", *J. Speech And Hear.*, (1982), Res. 25: 611-618.

Vanhuyse, V., Creten, W., Van Camp, K., "On The W-Notching Of Tympanograms", *Scand. Audiol.*, *(1975)*, 4: 45-50

Vanpeperstraete, P., Creten, W., "On The Asymmetry Of Susceptance Tympanograms", *Scand. Audiol.*, (1979).

Wilson, R., Shanks, J., Kaplan, S., "Tympanometric Changes At 226 Hz And 678 Hz Across 10 Trials And For Two Directions Of Ear Canal Pressure Change", *J. Speech And Hear.*, (1984), Res. 27: 257-266.

Wiley, T, Oviatt, D., Block, M., "Acoustic-Immittance Measures In Normal Ears", *J. Speech And Hear.*, (1987), Res. 30: 161-170.

Zwislocki, J., "An Acoustic Method For Clinical Examination Of The Ear", *J. Speech And Hear.*, (1963), Res. 6 (4): 303-314.

Zwislocki, J., Feldman, A., "Acoustic Impedance Of Pathological Ears", *ASHA Monograph*, (1970), No. 15. Washington.

SCREENING TYMPANOMETRY AND REFLEX

ASHA, "Guidelines For Acoustic Immittance Screening Of Middle-Ear Function", (1979), April: 283-288.

Bess, F., Bluestone, C., Harrington, D., Klein, J., Harford, E., "Use Of Acoustic Impedance Measurement In Screening For Middle Ear Disease In Children", *Ann. Otol. Rhinol. And Laryngol.*, (1978), 87 (2): 288.

Brooks, D., "An Objective Method Of Detecting Fluid In The Middle Ear", *J. Int. Audiol.*, (1968), 7: 280-286.

Brooks, D., "The Use Of The Electro-Acoustic Impedance Bridge In The Assessment Of Middle Ear Function", *J. Int. Audiol.,* (1969), 8: 563-569.

Groothius, J., Sell, S., Wright, P., Thompson, J., Altemeier, W., "Otitis Media In Infancy: Tympanometric Findings", *Pediatrics,* (1979), 63 (3): 435-442.

Lampe, R., Weir, M., McLeod, H. Aspinall, K., Artalejo, L., "Tympanometry In Acute Otitis Media", *Am. J. Dis. Child,* (1981), 135: 233-235.

Paradise, J., Smith, C., Bluestone, C., "Tympanometric Detection Of Middle Ear Effusion In Infants And Young Children", *Pediatrics,* (1976), 58: 198-210.

GRADIENT

Fiellau-Nikolajsen, M., "Tympanometry And Middle Ear Effusion: A Cohort-Study In Three-Year-Old Children", *Int. J. Ped. Otorhinolaryngology,* (1980), 2: 39-49.

de Jonge, R., "Normal Tympanometric Gradient: A Comparison Of Three Methods", *Audiology,* (1986), 25: 299-308.

ACOUSTIC REFLEX

Block, M.,Wiley,T. "Acoustic Reflex Growth And Loudness", *J. Speech And Hear.,* (1979), Res. 22: 295-310.

Borg, E., "Recovery Of The Human Intra-aural Muscle Reflex After "Pauses" Of Various Depth", *Acta Otolaryngology,* (1980), 90: 1-5.

Chiveralls, K., FitzSimons, R., Beck, G., Kerhohan, H., "The Diagnostic Significance Of The Stapedius Reflex", *Br. J. Audiol.,* (1976), 10: 122-128.

Clemis, J., "Acoustic Reflex Testing In Otoneurology", *Otolaryngol. - Head And Neck Surg.,* (1984), 92 (2): 141-144.

Cretin, W., Vanpeperstraete, P., Van Camp, K., Doclo, J., "An Experimental Study On Diphasic Acoustic Reflex Patterns In Normal Ears", *Scan. Audiol.,* (1976), 5: 3-8.

Dallos, P, "Dynamics Of The Acoustic Reflex: Phenomenological Aspects", *J. Acoust. Soc. Am.,* (1964), 36 (11): 2175-2183.

Djupesland, G., Zwislocki, J., "On The Critical Band In The Acoustic Stapedius Reflex", *J. Acoust. Soc. Am.,* (1973), 54 (5): 1157-1159.

Gersdorff, M., "Dynamic Study Of The Acoustico-Facial Reflex By Impedance Measurement", *Arch. Otorhinolaryngol.,* (1980), 228: 101-112.

Hodges, A., Ruth, R., "Subject Related Factors Influencing The Acoustic Reflex", *Sem. In Hear.,* (1987), 8 (4): 339-357.

Johnson, N., Terkildsen, K., "The Normal Middle Ear Reflex Thresholds Towards White Noise And Acoustic Clicks In Young Adults", *Scand. Audiol.,* (1980), 9: 131-135.

Leis, B., Lutman, M., "Calibration Of Ipsilateral Acoustic Reflex Stimuli", *Scand. Audiol.,* (1979), 8: 93-99.

Liden, G., Peterson, J., Harford, E., "Simultaneous Recording Of Changes In Relative Impedance And Air Pressure During Acoustic And Non-Acoustic Elicitation Of Middle Ear Reflexes", *Acta Otolaryngol.,* (1970), 263: 208-217.

Margolis, R., Dubno, J., Wilson, R., "Acoustic-Reflex Thresholds For Noise Stimuli", *J. Acoust. Soc. Am.,* (1980), 68 (3): 892-895.

Moller, A., "Acoustic Reflex In Man", *J. Acoust. Soc. Am.,* (1962), 34 (8): 1524-1534.

Popelka, G., Margolis, R., Wiley, T, "Effect Of Activating Signal Bandwidth On Acoustic-Reflex Thresholds", *J. Acoust. Soc. Am.,* (1976), 59 (1):153-159.

Popelka, G., "Hearing Assessment With The Acoustic Reflex", Grune & Stratton, Inc., New York, (1981).

Silman, S., "The Acoustic Reflex-Basic Principles And Clinical Applications", Academic Press, Inc., (1984).

Stach, B., Jerger, J., "Acoustic Reflex Patterns In Peripheral And Central Auditory System Disease", Sem.
In Hear., (1987), 8 (4): 369-377.

Stelmachowicz, R, Lilly, D., "An Indirect Estimate Of Auditory-Frequency Selectivity From Acoustic-Reflex
Measurements", *J. Acoust. Soc. Am.,* (1979), 65 (6): 1501-1508.

Wilbur, L., Kruger, B., Killion, M., "Reference Threshold Levels For The ER-3A Insert Earphone", *J. Acoust.*
Soc. Am., (1987), 81, Spring.

Wilson, R., McBride, L., "Threshold And Growth Of The Acoustic Reflex", *J. Acoust. Soc. Am.,* (1978), 63 (1): 147-154.

Woodford, C., Feldman, A., Wright, H., "Stimulus Parameters, The Acoustic Reflex, And Clinical Implications", *Speech And Hear.,* (1975), Rev. (Winter), 29-37.

Van Camp, K., Vanpeperstraete, P., Creten, W., Vanhuyse, V., "On Irregular Acoustic Reflex Patterns", *Scand. Audiol.,* (1975), 4: 227-232.

ACOUSTIC REFLEX - INFANTS

Bennett, M., Weatherby, L., "Newborn Acoustic Reflexes To Noise And Pure-Tone Signals", *J. Speech And Hear.,* (1982), Res. 25: 383-387.

Kankkunen, A., Liden, G., "lpsilateral Acoustic Reflex Thresholds In Neonates And In Normal-Hearing And Hearing-Impaired Pre-School Children", *Scand. Audiol.,* (1984), 13: 139-144.

Kruger, B., "The External Ear Resonance In Infants And Young Children", ASHA Meeting, Detroit, Michigan, (1986).

McMillan, P, Bennett, M., Marchant, C., Shurin, P, "lpsilateral And Contralateral Acoustic Reflexes In Neonates", *Ear And Hear.,* (1985), 6 (6): 320-324.

McMillan, P, Marchant, C., Shurin, P, "lpsilateral Acoustic Reflexes In Infants", *Ann. Otol. Rhinol. Laryngol.,* (1985), 94: 145-148.

Weatherby, L., Bennett, M., "The Neonatal Acoustic Reflex", *Scand. Audio.,* (1980), 9: 103-110.

Wiley, T, Goldstein, R., "Tympanometric And Acoustic-Reflex Studies In Neonates", *J..Speech And Hear.,* (1985), Res. 28: 265-272.

REFLEX DECAY (ADAPTATION)

Fowler, C., Wilson, R., "Adaptation Of The Acoustic Reflex", *Ear And Hear.,* (1984), 5 (5): 281-288.

Givens, G., Seidemann, M., "A Systematic Investigation Of Measurement Parameters Of Acoustic-Reflex Adaptation:, *J. Speech And Hear.* Dis., (1979), XLIV: 534-542.

Habener, S., Snyder, J., "Stapedius Reflex Amplitude And Decay In Normal Hearing Ears", *Arch. Otolaryngol.,* (1974), 100: 294-297.

Hirsch, A., Anderson, H., "Elevated Stapedius Reflex Threshold And Pathologic Reflex Decay", *Acta Otolaryngol.,* (1980), 368: 1 -28.
Jerger, J., Jerger, S., "Acoustic Reflex Decay: 10-Second Or 5-Second Criterion?", *Ear And Hear.,* (1983), 4 (1): 70-71.

Olsen, W., Noffsinger, D., Kurdziel, S., "Acoustic Reflex And Reflex Decay", *Arch. Otolaryngol.,* (1975), 101: 622- 625.

Olsen, W., Stach, B., Kurdziel, S., "Acoustic Reflex Decay In 10 Seconds And In 5 Seconds For Meniere's Disease Patients And For Vill th Nerve Tumor Patients", *Ear And Hear.,* (1981), 2 (4): 180-181.

Oviatt, D., Kileny, P., "Normative Characteristics Of lpsilateral Acoustic Reflex Adaptation", *Ear And Hear.,* (1984), 5 (3): 145-152.

Rosenhall, **U.,** Liden, **G.,** Nilsson, **E.,** "Stapedius Reflex Decay In Normal Hearing Subjects", *J. Am. Aud.*
Soc., (1979), 4: 157-163.

Wilson, R., Stechler, J., Jones, H., Margolis, R., "Adaptation Of The Acoustic Reflex", *J. Acoust. Soc. Am.,* (1978), 64: 782-791.

EUSTACHIAN TUBE FUNCTION (ETF)

Bluestone, C., Paradise, J., Beery, Q., "Physiology Of The Eustachian Tube In The Pathogenesis Of Middle
Ear Effusion On Children", *Laryngoscope,* (1972), 82: 1654-1670.

Bluestone, C., Paradise, J., Beery, Q., "Physiology Of The Eustachian Tube Function", *Ann. Otol.,* (1972), 90: 552-562.

Givens, G., Seidemann, M., "Acoustic Immittance Testing Of The Eustachian Tube", *Ear And Hearing,* 5 (5): 297-299.

Holmquist, J., "Eustachian Tube Function Assessed With Tympanometry", *Acta Otolaryngol.,* (1969), 68: 501-508.

Riedel, C., Wiley, T, Block, M., "Tympanometric Measures Of Eustachian Tube Function", *J. Speech and Hear. Res.,* (1987), 30: 207-214.

Seidemann, M., Givens, D., "Tympanometric Assessment Of Eustachian Tube Patency In Children", *J. Speech and Hear. Disord.,* (1977), 42: 487-496.

Seifert, M., Seidemann, M., Givens, G., "An Examination Of Variables Involved In Tympanometric Assessment Of Eustachian Tube Function In Adults", *J. Speech and Hear. Disord.*, (1979), 44: 388-396.

Virtanen, H., Marttila, T. "Middle-Ear Pressure And Eustachian Tube Function", *Arch. Otolaryngol.,* (1982), 108: 766-768.

Williams, P., "A Tympanic Swallow Test For Assessment Of Eustachian Tube Function", *Ann. Otol. Rhinol. Laryngol.,* (1975), 84; 339.

ARLT

Borg, E., "Time Course Of The Human Acoustic Stapedius Reflex", *Scand. Audiol., (1982),* 11: 237-242.

Clemis, J., Sarno, C., "The Acoustical Reflex Latency Test: Clinical Application", *The Laryngoscope,* (1980), 90: 601-611.

Jerger, J., Hayes, D., "Latency Of The Acoustic Reflex In Eighth-Nerve Tumor", *Arch Otolaryngol.*, (1983), 109: 1-5.

Jerger, J., Oliver, T., Stach, B., "Problems In The Clinical Measurement Of Acoustic Reflex Latency", *Scand. Audiol.*, (1986), 15: 31-40.

Mangham, C., Burnett, R, Lindeman, R., "Standardization Of Acoustic Reflex Latency", *Ann. Otol.*, (1982), 91: 169-174.

Norris, T, Stelmachowicz, P, Bowling, C., Taylor, D., "Latency Measures Of The Acoustic Reflex", *Audiology,* (1974), 13: 464-469.

Sellari-Franceschini, S., Bruschini, R, Pardini, L., Berrettini, S., "Quantification Of The Parameters Of The Acoustic Reflex In Normal Ears", *Audiology,* (1986), 25: 165-175.

Strasser, D., "Contralateral And lpsilateral Acoustic Reflex Latency Measures In Various Otologic Pathologies", Dissertation - Dept. of Communication, Univeristy of Utah, (1975).

ACOUSTIC REFLEX SENSITIZATION

Blood, I., Greenber, H., "Low-Level Acoustic Reflex Thresholds", *Audiol.*, (1981), 20: 244-250.

Chobot, J., Wilson, W., "The Effect Of Sensitization Of The Acoustic Reflex As A Function Of Frequency", *J. Aud.*, (1977), Res. 17: 99-104.

Deutsch, L., "Auditory Sensitization In The Human Stapedius Reflex", *J. Aud.*, (1973), Res. 13: 301-304.

Jeck, L., Ruth, R., Schoeny, Z., "High-Frequency Sensitization Of The Acoustic Reflex", *Ear And Hear.*, (1983), 4 (2): 98-101.

Reker, U., Baumgarten, D., "Binaurale Summation Des lpsilateralen Und Kontralateralen Akustis Chen Stapediusreflexes", (1980), HNO 28: 135-138.

Sesterhenn, G., Breuninger, H., "The Acoustic Reflex At Low Sensation Levels", *Audiol.*, (1976),15: 523-533.

Sesterhenn, G., Breuninger, H., "Determination Of Hearing Threshold For Single Frequencies From The Acoustic Reflex", *Audiol.*, (1977), 16: 201-214.

Stelmachowicz, P., Gorga, M., "Investigation Of The Frequency Specificity Of Acoustic Reflex Facilitation", *Audiol.*, (1983), 22: 128-135.

MULTIPLE FREQUENCY TYMPANOMETRY

Colletti, V., "Methodologic Observations On Tympanometry With Regard To The Probe Tone Frequency", *Acta Otolaryngolory,* (1975), 80: 54-60.

Colletti, V., "Tympanometry From 200 To 2000 Hz Probe Tone", *Audiol.,* (1976), 15: 106-119.

Funasaka, S., Kumakawa, K., "Tympanometry Using A Sweep-Frequency Probe Tone And Its Clinical Evaluation", *Audiol.,* (1988), 27: 99-108.

Funasaka, S., Funai, H., Kumakawa, K., "Sweep-Frequency Tympanometry: Its Developement And Diagnostic Value", *Audiol.,* (1984), 23: 366-379.

Lilly, D., "Multiple Frequency, Multiple Component Tympanometry: New Approaches To An Old Diagnostic Problem", *Ear and Hear.,* (1984), 5 (5): 300-308.

Margolis, R., Van Camp, K., Wilson, R., Creten, W., "Multifrequency Tympanometry In Normal Ears", *Audiol.,* (1985), 24: 44-53.

Appendix C

A few basic troubleshooting instructions are provided below for the TympStar instrument. The problems described below can arrise in the normal course of operation and can be resolved quickly. In the unlikely event that you encounter a problem that persists or a system malfunction, please contact your GSI service provider for technical assistance. Never open the enclosure.

WARNING!

WARNING
There are no internal adjustments or assemblies that will ever require end-user attention. Never open the GSI TympStar enclosure.

Basic problem solving

Problem:
- The screen is blank.

Possible solutions:
- Make sure that the power cord is fully connected on both ends, and that the power switch is in the ON state (1).
- Make sure that the power source (wall socket) is providing power. Power must be in the range of 100 – 240 VAC at 50 to 60 Hz.

Problem:
- The system reports lack of pressure or lost pressure seal when trying to run a test.
- Possible solutions:
- Change the eartip to provide a better seal (correct size) of the patient's ear canal.
- Clean the probe tubes to remove debris/obstructions (see chapter 3).

Problem:
- Test results do not appear as expected.

Possible solutions:
- Position the probe box to minimize vibrations.
- Clean the probe tubes to remove debris/obstructions (see chapter 3).

Problem:

- Paper jams in printer.

Possible solutions:

- Reorient the paper in the printer (see chapter 2).

Problem:

- Printed text is not readable.

Possible solutions:

- The thermal paper can be printed on only one side. Change the paper orientation (see chapter 2).

Remote Specifications D

1 The Remote Function

The Remote function provides serial communications capability to the GSI TympStar using an RS 232 interface. The serial communication provides the ability for the GSI TympStar to transmit status information and test result data to a Remote Device (such as a computer or data logging device) for further processing or storage. The GSI TympStar may also receive commands from a Remote Device allowing remote control and setup of the GSI TympStar.

The Remote function is standard in all TympStar systems.

2 General Operation

The Remote function is available during all operating modes of the unit and is selected by pressing the REMOTE hard key or via a command from the Remote Device. When the Remote function is active, it may be turned off by pressing the REMOTE hard key again. Pressing the REMOTE hard key allows the GSI TympStar to send and receive information over the RS 232 interface. Data transmission by the GSI TympStar can be initiated by pressing the DATA TRANSFER hard key or remotely via a command sent by the Remote Device. The GSI TympStar will be able to receive commands from the Remote Device at any time during its operation while the Remote function is selected and the GSI TympStar is not processing a previous front panel operation or remote command. These commands will allow the Remote Device direct access to most of the GSI TympStar front panel hard and soft keys to select test parameters and control test execution.

Outgoing data from the TympStar may be sent in one of two formats: GSI 33 or TympStar. The former sends out data in the format identical to the GSI 33 instrument (predecessor to the TympStar). The latter extends the GSI 33 format to include data unique to the TympStar instrument; for example 26 tests (the GSI 33 is limited to 8). The GSI 33 or TympStar formats are selected under the Instrument Options menu - Remote Setup (see Chapter 4).

3 Serial Interface

3.1 General Operation

The Remote function will communicate with a Remote Device over an RS 232 compatible asynchronous interface. The GSI TympStar is configured as a DCE (Data Communication Equipment) device and would normally connect to a DTE (Data Terminal Equipment) device, such as a personal computer (PC).

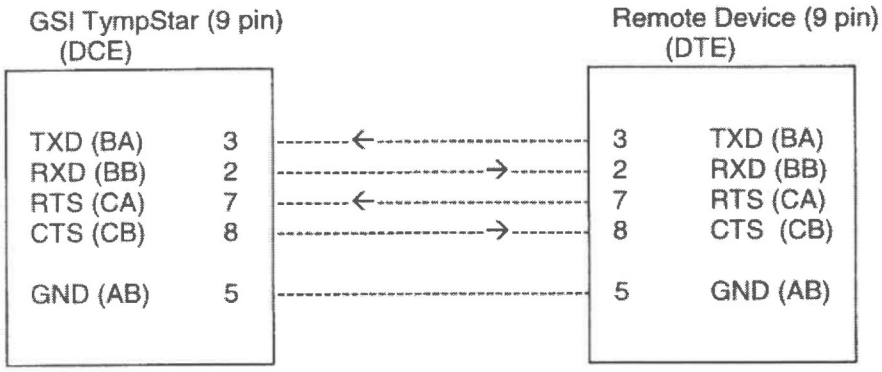
3.2 Interface Connections

The GSI TympStar Remote interface connector is a standard 9-pin "D" style female connector.

3.2.1 DCE to DTE Interface Connection Pin Assignments

Left arrow (←) and Right arrow (→) denote the direction of the signal.

TXD = Transmitted Data	RXD = Received Data
RTS = Request to Send	CTS = Clear to Send



3.3 Interface Configuration

The interface configuration requires that 7 data bits be used. This is fixed and not modifiable by the user. The Baud Rate, Parity,Number of Stop bits and RTS/CTS handshaking are modifiable in Instrument Options under the Remote Settings option. The baud rate, parity, and stop bits must match that of the remote device or else there can be no communication between the GSI TympStar and the remote device.

Baud rate can be set to 300, 600, 1200, 2400, 4800, 9600 or 19200. Available Parity settings are None, Even and Odd. Number of Stop bits can be set to 1 or 2. RTS/CTS handshaking can be enabled or disabled.

3.4 RTS/CTS Hardware Handshaking

The Remote Device may use the RTS signal to allow or inhibit data transmission from the GSI TympStar to the Remote Device; when the RTS signal is set true (asserted) by the Remote Device the GSI TympStar is enabled to transmit data. When the RTS signal is set false by the Remote Device, the GSI TympStar is inhibited from transmitting data. The Remote Device should insure that RTS is set true prior to requesting data from the GSI TympStar to prevent a timeout error on the GSI TympStar due to it being inhibited from transmitting data.

The GSI TympStar uses the CTS signal to allow or inhibit data transmission from the Remote Device to the GSI TympStar. When the CTS signal is set true (asserted) by the GSI TympStar the Remote Device may transmit to the GSI TympStar. When the CTS signal is set false by the GSI TympStar the Remote Device must not transmit to the GSI TympStar. Failure to comply with this condition may result in loss of data transmitted to the GSI TympStar.

The GSI TympStar does not currently use the DTR and DSR signals and therefore does not support handshaking using these signals.

The GSI TympStar will set the CTS line false to prevent data transmission by the Remote Device while the GSI TympStar is processing either a front panel pushbutton operation or a command record set from the Remote Device. The CTS line will also be set false by the GSI TympStar during all data transfers to the Remote Device. When the processing is complete the CTS line will be set true to allow transmission by the Remote Device.

3.5 Baud Rate Selection

To minimize transmission times the highest baud rate that is supported on both the GSI TympStar and the Remote device should be selected.

4 Remote Mode Entry and Exit

4.1 Remote Hard key

The Remote mode is entered or exited by pressing the REMOTE hard key or via a Remote Mode command sent from the Remote Device. If not in Remote mode, the word REMOTE will show up in the lower right side of the screen when the REMOTE hard key is pressed. If the REMOTE status message is already showing, pressing the REMOTE hard key will exit the remote mode and clear the REMOTE status message.

4.2 Remote Instrument Options settings

The Record Type and Clear Test options are set in Instrument Options for the GSI TympStar under Data Transfer Settings.

For the Record Type option, all tests can have a selected record type: Summary or Summary and Graphics. The default Record Type setting is SUMMARY.

The RECORD TYPE softkey allows the operator to select what type of information is transmitted by the GSI TympStar when the DATA TRANSFER hard key is operated. A Summary Data record contains test identifier information, test parameter selections and summary test results. A Summary + XY Graphical Record format contains test identifier information, test parameter selections, summary test results and the X,Y graphical test results. The current RECORD TYPE softkey selection will be displayed as either "SUMMARY" or "SUMMARY + XY" above the softkey.

For the Auto Clear option, two options can be chosen: Automatic or Manual. The default Clear Test setting is MANUAL.

The CLEAR TEST softkey allows the operator to have test data automatically cleared from the LCD screen and the page memory when the data is transmitted by selecting the AUTO softkey.
If MANUAL is operated the operator must manually clear the test data, if desired, after data transmission. The current CLEAR TEST softkey selection is displayed as either "MANUAL" or "AUTO" directly above the softkey.

The outgoing data format is selected as either GSI 33 DATA or GSI TYMPSTAR DATA. The menu DATA FORMAT is found in Instrument Options under Remote settings.

The GSI 33 DATA softkey allows for the transfer of a data stream that will be in the same format as the GSI 33 outgoing data while when the GSI TYMPSTAR DATA softkey is selected, a new data stream will be sent which consists of all the information from the GSI 33 data stream as well as any new items specific to the GSI TympStar.

Once the Remote Mode is entered, the DATA TRANSFER hard key is enabled.
This is indicated on the LCD display by the word "REMOTE" displayed on the right margin of the message line.

5 Remote Output Operation

5.1 Data Transfer Key Press

The transmission of data from the GSI TympStar to the external device is initiated by either operating the DATA TRANSFER hard key or by a command record from the Remote Device.

The following conditions indicate when a data transfer request is invalid and the corresponding error message which will indicate the invalid condition:

Remote Mode not selected
"ALERT REMOTE MODE NOT SELECTED"
The current test is in progress i.e. the START LEFT or START RIGHT hard key has been operated and in Reflex type tests, a stimulus is being presented
"ALERT - INVALID WHILE TEST IN PROGRESS"

If an invalid data transmission is attempted the indicated error message is momentarily displayed with the word ALERT flashing. If the invalid transmission was initiated by a remote command an error record is sent to inform the Remote Device of the error and its cause.

When using the DATA TRANSFER hard key, the data which is transmitted to the Remote Device is the data for the test which is currently displayed on the LCD. This allows for the transmission of data for the current test or for a previous test if the transmission is initiated while displaying a previous test in the Page mode. When the status message over the test number in Page mode displays ALL, all the tests in page memory will be transferred. When transmitting data in response to a command from the remote device, the test that is being transferred is not always displayed on the LCD.

When a valid DATA TRANSFER operation occurs the message "ALERT DATA TRANSMISSION IN PROGRESS" is displayed. All pertinent parameter and test data are then collected from the page memory, formatted and stored in a buffer area for transmission to the Remote Device. While the data collection, buffering and transmission is in progress all front panel pushbuttons, except for the STOP hard key, are invalid. Pressing any of these invalid keys results in the error message "ALERT INVALID SELECTION. DATA TRANSFER IN PROGRESS" being displayed momentarily with the word "ALERT" flashing. When the transmission is complete all pushbuttons are valid and the "TRANSMISSION IN PROGRESS" message will be erased. If the DATA TRANSFER hard key is operated while a data transfer is already in progress the current transfer is terminated. The warning message "ALERT DATA TRANSFER ALREADY IN PROGRESS" flashes momentarily.

When a data transfer from the GSI TympStar to the Remote Device is initiated or at any time during the transmission, if the Remote Device disables the transmission by setting the RTS line false for greater than 10 seconds the GSI TympStar aborts the transmission. The error message "ALERT - DATA TRANSFER INHIBITED DATA TRANSFER ABORTED" is displayed momentarily with the word ALERT flashing. This error message replaces the "DATA TRANSFER IN PROGRESS" message. No error record will be sent to the Remote Device.

The information that is transmitted consists of either test results or unit status information in formatted records. In all cases the format of the records are the same for a Version 1 and Version 2 TympStar unit. The parameters that are not selectable on Version 1are indicated as the default selection (such as Probe Tone = 226 Hz) or as a null selection (sequence of "-" characters) (such as for the Click Rate).

5.2 Record Types

The types of output records are as follows:

Record Type	Record Description
1	Summary data record: Contains test parameter and summary test results.
2	XY Graphical data record: Contains X,Y graphical data. Due to the large amount of data that may have to be transmitted the data is transmitted in multiple records with each record containing up to 29 XY data pairs.
3	End of XY Graphical data record: Sent to indicate the end of a series of Summary and XY Graphical data records.
4	Error record: Use to indicate error conditions which may occur during remote control of the GSI TympStar. The following error conditions are indicated: See Section 9 for a description of the error codes.
5	Current X,Y data record: Contains the current Y axis and X axis values or other parameter values of importance in the current unit state.
6	Unit identifier data record: Contains the unit type (GSI TympStar), version (1/2), unit identifier number and software revision information. The unit identifier number is defaulted to 0000 until it is set by the Remote Device. Once set by the Remote Device it is defaulted back to 0000 when the User Default data is loaded in the Calibration Mode. At this time the Signal Processor software revision will default to 00.00.
7	Test mode change status record: When enabled, automatically sent by the GSI TympStar when it automatically changes test mode to notify the external device.
8	Summary data record with attached XY Graphical data records: Used when the operator has selected the Summary and XY Graphical data record type. This record is exactly the same as a type 1 summary data record but is used in this case to indicate to the Remote device that additional records will follow this one which contain the XY graphical data associated with this test parameter and summary test result information.
9	Input Query Results Record Contains information that was requested by an input record. Query results could contain parameter values and text strings.

5.3 General Record Information

5.3.1 Rules for Records

- All records are sent as ASCII characters starting with an **"|"** character and ending with a checksum, carriage return and line feed.
- All multiple ASCII character fields are right justified with unused character positions filled with ASCII "SPACE" characters.
- All zero (null) fields are filled with "—" characters.
- All numerical test data or results are sent in the same format and accuracy as they are displayed on the LCD screen whenever possible. Any differences are detailed in Section 7.

- All Summary Data records consist of the following general format:
  - | (Start of record symbol)
  - Record Type
  - Record Sequence Number
  - Test type and number
  - Test parameters and numeric test results
  - Checksum
  - Carriage Return
  - Line Feed
- All status records consist of the following general format:
  - | (Start of record symbol)
  - Record Type
  - Record Sequence Number
  - Status Information
  - Checksum
  - Carriage Return
  - Line Feed
- All XY Graphical Data records consist of the following general format:
  - | (Start of record symbol)
  - Record Type
  - Record Sequence Number
  - Test number Line number
  - Number of XY data pairs in this record
  - XY graphical data
  - Checksum
  - Carriage Return
  - Line Feed

5.3.2 Checksum

The checksum is provided to allow the Remote Device a means to detect data transmission errors. The checksum is generated by the GSI TympStar after the record has been formatted in the transmit buffer. The checksum is the arithmetic sum in hexadecimal of all 8 bit bytes in the record starting with the **"|"** character until, and including, the last data byte before the first byte of the checksum. The checksum itself and the "CR", "LF" are not included in the checksum calculation. The checksum is truncated to the least significant 8 bits, converted to 2 ASCII characters, and then inserted into the record before transmission.

5.3.3 Record Sequence Number

The record sequence number is a number between 00 and 99 in modulo 99 format which is set by the GSI TympStar when the record is transmitted. For each new record transmitted the number is incremented by 1. If a record must be retransmitted the number is not changed and remains the same value as in the previous transmission. The record sequence number is provided to allow the Remote Device a means to detect if a record it has received is a new record or a retransmission of the previous record.

5.3.4 Record Size

The actual length and format of the data records vary based on the type of test and the length of the test (the number and amount of lines used). The record contains data only for the number of lines or traces which were actually used during the test. The maximum total size of all records in any case do not exceed 512 bytes. The record formats defined in Section 7 are for the worst case condition when the maximum amount of data for a test is transmitted.

5.4 Summary and XY Graphical Data

When the Summary and XY Graphical record type is selected upon entering the Remote Mode, the actual X and Y axis values used to plot the graphs on the LCD screen are sent in addition to the test parameter and numerical test results.

The test's summary data and XY graphical data transferred to the Remote Device are broken up into a sequence of records. This is necessary due to the large amount of XY graphical data that may be transmitted for a test.

The first record is a summary data record (record type 8) to transfer the test parameter information and summary test results. This record is followed by a series of XY Graphical data records. If no XY data exists yet for this test a summary data record is transmitted followed by an End of XY Graphical data record. See Section 7 for the record format. The actual number of XY Graphical data records vary based on the actual amount of graphical information stored for the test. The last XY Graphical data record for each line may contain a fewer number of XY data pairs than the others of that line based on the number of XY data pairs left to transmit. The sequence in which the XY data pairs are transmitted is the XY data pairs for line 1 in left to right order, the data pairs for line 2 in left to right order and then the data pairs for line 3 in left to right order.

The record series will be terminated with an End of XY Graphical data record. See Section 7 for the format of this record.

5.5 Transmission Verification Protocol

5.5.1 ARQ Protocol

When any type of record is transmitted to the Remote Device the GSI TympStar knows that the record has been correctly received by the Remote Device. This is accomplished by using an Auto Repeat Request (ARQ) type protocol. Under this protocol the GSI TympStar will transmit a record and then wait for a reply from the Remote Device to indicate the successful or unsuccessful receipt of the record. If the record was received correctly the Remote Device responds with an ACK (acknowledge) response record. The determination of a successful record receipt will be the responsibility of the Remote Device to define, but, at a minimum, should include checking for a valid start of record character (ASCII "|") and a valid checksum for the record. If the record was not received correctly the Remote Device must respond with a NAK (negative acknowledge) response record. See Section 8 for the format of the ACK and NM records. Upon receipt of an ACK record the GSI TympStar transmits the next record, if additional records are to be transmitted, or deletes the test data just transmitted from the page memory if the Auto Clear feature is selected, and then terminate the transmission process. If a NAK record is received the GSI TympStar retransmits the same record. A maximum of 2 retransmissions of a record will be attempted by the GSI TympStar. If the record is still not received correctly the data transfer will be aborted. The error message"ALERT - DATA TRANSFER ERROR. DATA TRANSFER ABORTED" will be displayed on the LCD screen momentarily with the word ALERT flashing. No error record will be sent to the Remote Device. This ARQ Protocol is required only for data transmission from the GSI TympStar to the Remote Device and is not used for transmissions from the Remote Device to the GSI TympStar.

5.5.2 ACK/NAK not Received

After each record is transmitted by the GSI TympStar the GSI TympStar waits for a maximum of 10 seconds for the ACK or NAK record. If one or the other is not received within the time limit the GSI TympStar assumes that the record was not received correctly by the Remote Device and retransmits the record just as if a NAK record had been received. Each record will contain a record sequence number that allows the Remote Device to determine if a record is a retransmission of an incorrectly received record or is a new record.

5.5.3 Transmitting Series of Data Blocks

When the GSI TympStar is transmitting a series of Summary and XY Graphical data block records, each record is sent using the ARQ protocol and the transmission proceeds in this manner until all data block records have been transmitted. At that time the GSI TympStar transmits an End of Data record (See Section 7 for the record format) to inform the Remote Device that all data has been transferred. The Remote Device must again respond with an ACK or NAK to complete the transfer.

5.6 Auto Clear Operation

If the Auto Clear feature is selected prior to the transfer of data, then, after Summary test data or Summary and XY Graphical data has been successfully transmitted to the Remote Device, the test data is automatically cleared from the LCD screen and from the page memory. The Auto Clear function operates only for data transfers initiated by the Data Transfer hard key.

If the data transfer occurs while in STOP, all summary and XY Graphical test data for the test just completed are cleared from the LCD screen and the page memory. The test remains in STOP and the test number is not incremented when the next test is started.

If the data transfer occurs while in HOLD, all summary and XY Graphical test data for the current test arer cleared from the LCD screen and the page memory. The test remains in HOLD and the test number will not change.

If the data transfer occurs while a Reflex test is in RUN but without a stimulus being presented, all summary and XY Graphical test data for both lines are cleared from the LCD screen and the page memory. If the CONTINUE softkey was being displayed, it is erased and replaced by the normal menu and stimulus presentations are then allowed. The next stimulus presentation is plotted at the beginning of the top line. The test remains in RUN and the test number is not changed.

The Auto Clear function does not operate when data transfer occurs in the Page mode, in the ETF TM test or in a Multiple Frequency Screen #1 and #2 test.

5.6.1 Output Records

For the detailed Output Record formats see Section 7.

6 Remote Input Operation

The Remote input feature allows the GSI TYMPSTAR to receive commands or data from the Remote Device. The commands give the Remote Device access to most front panel controls by simulating the operation of the front panel controls. While the Remote Mode is enabled the front panel controls are still active, allowing the unit to be simultaneously manually and remotely controlled. There will be no priority between the Remote commands and the Manual commands. All keys that are pressed while another command is in process are processed when the first key is complete. The STOP key has priority over any other key press. Whenever the Stop Key is pressed all queued keystroke command (both manual and remote) are flushed out and stopped.

Remote commands consist of three basic types; single key (soft and hard) presses, special commands and text entry commands.

The single keystroke commands allow the Remote Device to directly control all soft or hard keys. Manual is the only key that cannot be pressed since manual mode is not accessible remotely.
An example is a command which directly presses softkey 3.

The special commands are provided to allow the Remote Device to make selections not available as a soft or hard key, or to directly modify a parameter that is normally changed by scrolling through a range of selections, such as the activator stimulus or intensity. These special commands also allow for querying of values for parameters so that any changes can be checked remotely.

The text entry command is used to enter patient, tester and facility information. These commands also have querying capabilities.

When a remote command is being processed the status message "ALERT REMOTE COMMAND IN PROGRESS" is displayed on the status line. This message is displayed until the processing of the command is complete or for 1 second, whichever is longer.

The Remote Device has the ability to directly modify all parameters for the current test.
When a parameter is changed, the menu on the LCD screen does not change as it does when softkeys are manually operated. If a parameter, which is represented by a softkey in the currently displayed menu, is modified the new parameter value is indicated above the softkey on the status line, just as if the parameter had been changed manually. If a single keystroke, softkey or hardkey is remotely pressed, the screen and menu changes as it does when these keys are manually operated.

If the softkey corresponding to the modified parameter is not in the currently displayed menu, the parameter will still be changed immediately but the new parameter value is not indicated on the status line until the menu containing that softkey is displayed by manually operating softkeys or the RETURN hard key.

If a parameter whose status is indicated on the LCD screen in a position other than the status line (i.e. Intensity, Stimulus, Auto Timing ON,OFF,Quantity, etc) is changed, the new parameter selection is indicated at the time of the change in its normal position on the LCD screen.

When mode switches are made by the Remote Device, the same parameter defaults which would have occurred if the parameter was changed manually still occur. Examples of this are remotely pressing the TYMP hard key which causes all of the Tymp test softkeys to be defaulted to the parameters stored in the User memory, or selecting a long Reflex Threshold ON time which may force the OFF time to default to a shorter time.

The Remote input consists of short records transmitted from the Remote Device to the GSI TympStar. Since the GSI TympStar has remote querying abilities there are two options for each record, sending a change to a parameter or querying the value of a parameter. When the record is being processed, if a query command is requested, any bytes following the request code are ignored. The query results are sent to the remote system as short records that can be seen in the 9.3.8 Input Record Query Results section of the remote specifications.

Records may be sent during all operating modes of the GSI TympStar at any time that the selected handshaking indicates that the GSI TympStar is able to accept records. When a record is sent the RS232 interface software receives and validates each character of the record as it is sent. When a full record has been received, it is decoded and validated. Most of the special commands are only accepted in the STOP state, while single soft key and hardkey presses are valid whenever the associated manual key press is valid and finally the text entry commands are only valid when the cursor is flashing.

The command or operation requested by the record is queued for processing by the GSI TympStar. The command is processed immediately if the GSI TympStar is not currently processing a previous remote command or front panel operation or as soon as the previous processing is completed.

From the time a complete and valid command is received until the processing of the command is finished the RS232 interface indicates to the Remote Device that the GSI TympStar is unable to accept additional input by setting the CTS handshaking line false. This is only valid when the CTS/RTS parameter is set to ON in Instrument Options.

6.1 Record Validation

In most cases, the validation of incoming remote commands is a three-step process. The three steps are validation of the record itself, validation of the state and test mode, and finally validation of the specific command and subcodes.

Validation of the record include making sure the format of the record is correct for processing.

- Each record must begin with a "|" character and end in a valid "CRLF" sequence.
- Each received character of a record is checked to insure that it is a valid ASCII character.
- Each record must contain a valid record type.

Each record is valid for specified test modes and test states. For example, almost all tests will be invalid when the TympStar is in Run mode.

Finally, validation of specific commands depends on the subcodes and different structures of the commands. Included in validation of specific commands are:

- All records must contain the correct number of characters for the record type.
- Each single keystroke command record must contain a valid function code.
- Each special commands command record must contain a valid function sub code unless the function sub code is not used.
- All fields of all other record types must contain a value in the range specified for the record in Section 8.

6.1.1 Keystroke Command Validation

For single keystroke commands that remotely control the hard keys and soft keys, the validation process includes the validation of the corresponding pushbutton. These Invalid remote commands display an error message on the LCD screen and are also sent back to the remote device. The error record that is sent is in the standard error record format with 101 as the error code and a subcode representing the string number of the error message that was displayed. Therefore, remote commands which activate a hard or soft key are only valid during tests in which that hard or soft key is normally available.

6.1.2 Non-Keystroke Command Validation

For all other invalid remote commands, an error message is not displayed on the LCD screen and an error message record is transmitted to the Remote Device indicating the invalid command.

6.1.3 Miscellaneous Validation

On a Version 1 unit all test parameters, tests or features that are unique to Version 2 are invalid. If any errors occur, the GSI TympStar will not accept the record and an error message record will be sent back to the Remote Device to indicate the type of error that had occurred. See Section 9 for the description of the error records.

All input records must be sent by the Remote Device as a sequence of ASCII characters starting with a vertical bar and ending with an ASCII carriage return (CR) and line feed character (LF). Any record that is sent to the TympStar from a remote system that does not start with a vertical bar is ignored. In order to reduce the risk of an invalid record being accepted by the GSI TympStar due to a transmission error, the GSI TympStar only accepts a CR/LF sequence at the end of a record.

All multiple character fields are right justified with any unused character positions filled with ASCII "SPACE" characters.

The minus sign of negative values in a numeric field may be located in any character position to the left of the most significant digit of the number. The plus sign of positive values is implied, so a numeric field containing a positive number should not contain a **"+"** character.

6.2 Special Command Descriptions

The types of input records that may be sent to the GSI TympStar are as follows:
Note: All of these commands are only valid in the top menus of the test they are associated with unless otherwise specified. All cursor records are only available when in that specific cursor screen.

001 Single Key Commands

Used to initiate a hardkey or softkey press. The remote key press that is sent acts exactly like a key press on the TympStar and the keys are valid in the same instrument states as the corresponding hard or soft key.

002 Start Auto Sequence Command

Used to start an Auto-Sequence test. The user must be on the Tymp Diagnostic screen for this remote command to be valid.

003 Set TYMP Diagnostic Probe Hz

Used to change the Probe Hz parameter. This command is only valid in the Tymp Diagnostic test mode. Any change that occurs due to a change in Probe Hz changes immediately as if the change was made navigating the menus.

004 Set TYMP Diagnostic Admittance

Used to change the Admittance parameter. This command is only valid in the Tymp Diagnostic test mode. Any change that occurs due to a change in Admittance changes immediately as if the change was made navigating the menus.

005 Set TYMP Diagnostic Pressure Range

Used to change the Pressure range between Normal and Wide. This command is only valid in the Tymp Diagnostic test mode.

006 TYMP Diagnostic Ear Toggle

Used to toggle between Left and Right Ear. This command is only valid in the Tymp Diagnostic test mode.

007 Set TYMP Diagnostic Pressure Rate

Used to modify the Pressure rate parameter. This command is only valid in the Tymp Diagnostic test mode.

008 Set TYMP Diagnostic Start Pressure

Used to modify the Start Pressure parameter. This command is only valid in the Tymp Diagnostic test mode.

009 Set TYMP Diagnostic Baseline

Used to modify the Baseline parameter (On or Off). This command is only valid in the Tymp Diagnostic test mode.

010 Set TYMP Diagnostic Gradient

Used to set the Gradient ON and modify the type of Gradient to be used. This command is only valid in the Tymp Diagnostic test mode.

011Set TYMP Diagnostic Cursor

Allows the cursor to be moved to a specified X-axis position when the cursor is active and allows the user to set the Tymp peaks. This command is valid in Tymp Diagnostic as long as the test is either complete or in HOLD and a line has already been plotted.

012 Set TYMP Screening Pressure Range

Used to change the Pressure range between Normal and Wide. This command is only valid in the Tymp Screening test mode.

013Set TYMP Screening Pressure Rate

Used to modify the Pressure rate parameter. This command is only valid in the Tymp Screening test mode.

014 Set TYMP Screening Start Pressure

Used to modify the Start Pressure parameter. This command is only valid in the Tymp Screening test mode.

015 Set TYMP Screening Gradient

Used to set the Gradient ON and modify the type of Gradient to be used. This command is only valid in the Tymp Screening test mode.

016 TYMP Screening Ear Toggle

Used to toggle between Left and Right Ear. This command is only valid in the Tymp Screening test mode.

017 Set TYMP Screening Baseline

Used to modify the Baseline parameter (On or Off). This command is only valid in the Tymp Screening test mode.

018 Set TYMP Screening Auto Start

Used to change the Auto Start selection. If selection is OFF and is changed to ON remotely, and the probe is in a sealed cavity, a test starts as it would when the softkey itself was changed using softkey presses. This command is only valid in the Tymp Screening test mode.

019 Set TYMP Screening Reflex Type

Used for the selection of the Reflex type or to turn off the Reflex type. This command is only valid in the Tymp Screening test mode.

020 Set TYMP Screening Stimulus Hz

Used for modifying the different stimulus Hz (500, 1000, 2000, 4000). When Ipsi or Contra is selected as Reflex type, two stimuli can be turned on. This command is only valid in the Tymp Screening test mode.

021 Set TYMP Screening Cursor

Allows the cursor to the moved to a specified X-axis position when the cursor is active and allows the user to set the Tymp peaks. This command is valid in Tymp Screening as long as the test is complete and a line has already been plotted.

022 Set Reflex Threshold Stimulus Ear

Allows the Stimulus ear parameter to be selected remotely. This command is valid in a Reflex Threshold test.

023Set Reflex Threshold Mark Threshold

Sets the Threshold marker (NR or *) to the specified trace. This command is valid in a Reflex Threshold test after test has been run. This incoming record can only be used when in the mark threshold menu.

024 Set Reflex Threshold—Threshold Seek

Allows the configuration of the minimum change, start dBHL, stop dBHL of the Threshold Seek. This command is valid during a Reflex Threshold test.

025 Set Reflex Threshold Auto Zero

Used to change the Auto Zero parameter (ON or OFF). This command is valid in a Reflex Threshold test.

026 Reflex Threshold Ear Toggle

Used to toggle between Left and Right Ear. This command is only valid in the Reflex Threshold test mode.

027 Set Reflex Threshold Probe Hz

Used to change the Probe Hz parameter. This command is only valid in the Reflex Threshold test mode. Any additional changes that occurs due to a change in Probe Hz occurs immediately as if the change was made from navigating the menus.

028 Set Reflex Threshold Admittance

Used to change the Admittance parameter. This command is only valid in the Reflex Threshold test mode. Any screen or test change that occurs due to a change in Admittance changes immediately as if the change was made navigating the menus.

029 Set Reflex Threshold Stimulus Timing

Allows direct modification of timing (ON Time, OFF Time and Quantity) parameters in msec in the defined increments and range for the test. This command is valid in all Reflex Threshold tests as long as a stimulus is not being presented.

030 Set Reflex Threshold Timebase

Allows direct modification of timebase. Instead of using arrows like the softkeys, an integer is used to select one of the 4 possible timebases (15s, 30s, 45s, and 60s). This command is valid in Reflex Threshold tests.

031 Set Reflex Threshold Step size

Allows the user to remotely change the step-size, which controls the increments for the probe intensity. This command is valid in Reflex Threshold tests.

032 Set Reflex Threshold ml Scale

Used to change the scale of the Reflex plot. This command is valid in Reflex Threshold tests.

033 Set Reflex Threshold Click Rate

Allows selection of click rate in the standard increment and range. This command is valid during a Reflex Threshold test as long as a stimulus is not being presented.

034 Set Reflex Threshold Cursor

Allows the cursor to be moved to a specified X-axis position when the cursor is active. This command is valid in Reflex Threshold as long as a tone is not being processed and there is already data plotted.

035 Set Reflex Threshold Stimulus

Allows selection of stimuli based on valid stimuli for the current test. This command is valid during a Reflex Threshold test as long as a stimulus is not being presented.

036 Set Reflex Threshold Intensity

Allows direct selection of intensity in 1 dB steps in current valid intensity range. This command is valid during a Reflex Threshold test as long as a stimulus is not being presented.

037 Set ETF Intact Probe Hz

Used to change the Probe Hz parameter. This command is only valid in the ETF Intact test mode. Any change that occurs due to a change in Probe Hz occurs immediately as if the change was made from navigating the menus.

038 Set ETF Intact Pressure Range

Used to change the Pressure range between Normal and Wide. This command is only valid in the ETF Intact test mode.

039 Set ETF Intact Pressure Rate

Used to modify the Pressure rate parameter. This command is only valid in the ETF Intact test mode.

040 Set ETF Intact Start Pressure

Used to modify the Start Pressure parameter. This command is only valid in the ETF Intact test mode.

041 ETF Intact Ear Toggle

Used to toggle between Left and Right Ear. This command is only valid in the ETF-Intact test mode.

042 Set ETF Intact Admittance

Used to change the Admittance parameter. This command is only valid in the ETF Intact test mode. Any change that occurs due to a change in Admittance changes immediately as if the change was made navigating the menus.

043 Set ETF Intact Baseline

Used to modify the Baseline parameter (On or Off). This command is only valid in the ETF Intact test mode.

044 Set ETF Intact Cursor

Allows the cursor to be moved to a specified X-axis position when the cursor is active and allows the user to set the Tymp peaks. This command is valid in ETF Intact as long as the test is complete.

045 Set ETF Intact Continue

Processes continue softkey that is displayed between Tymp sweeps. This is valid only when the continue softkey is displayed in ETF Intact test mode. This can only be used when the continue softkey is diaplayed.

046 Set ETF Perforated Pressure Max

Allows selection of the maximum pressure in the standard increment and range. This command is valid during an ETF - Perforated TM test while the test is stopped.

047 Set ETF Perforated Time (sec)

Allows the selection for the time. Any changes that occur to the screen when the time is changed occur immediately. Instead of using the arrows to change the Time, an integer will be used to select between the 4 Time choices (30s, 40s, 50s, and 60 s). This command is only valid in the ETF – Perforated test mode when the test is stopped.

048 Set ETF Perforated Cursor

Allows the cursor to be moved to a specified X-axis position when the cursor is active. This command is valid in the ETF Perforated test mode when a test has finished plotting.

049 ETF Perforated Ear Toggle

Used to toggle between Left and Right Ear. This command is only valid in the ETF Perforated test mode.

050 Set Reflex Decay Probe Hz

Used to change the Probe Hz parameter. This command is only valid in the Reflex Decay test mode. Any change that occurs due to a change in Probe Hz occurs immediately as if the change was made from navigating the menus.

051 Set Reflex Decay Stimulus Ear

Allows the Stimulus ear parameter to be modified remotely. This command is valid in a Reflex Decay test.

052 Set Reflex Decay Stimulus On-Time

Allows direct selection of the On-Time parameter in msec under the constraints of the defined increments and range for the test. This command is valid in the Reflex Decay test mode as long as a stimulus is not being presented.

053 Set Reflex Decay Auto Zero

Used to change the Auto Zero parameter (ON or OFF). This command is valid in a Reflex Decay test.

054 Reflex Decay Ear Toggle

Used to toggle between Left and Right Ear. This command is only valid in the Reflex Decay test mode.

055 Set Reflex Decay Admittance

Used to change the Admittance parameter. This command is only valid in the Reflex Decay test mode. Any change that occurs due to a change in Admittance changes immediately as if the change was made navigating the menus.

056 Set Reflex Decay Timebase

Allows direct selection of timebase. Instead of using arrows like the softkeys, an integer is used to select one of the 4 possible timebases (15s, 30s, 45s, and 60s). This command is valid in the Reflex Decay test mode.

057 Set Reflex Decay Step size

Allows the user to remotely change the step-size, which controls the increments for the probe intensity. This command is valid in the Reflex Decay test mode.

058 Set Reflex Decay ml Scale

Used to change the scale of the Reflex plot. This command is valid in the Reflex Decay test mode.

059Set Reflex Decay Cursor

Allows the cursor to be moved to a specified X-axis position when the cursor is active. This command is valid in Reflex Decay as long as a tone is not being processed and there is already data plotted.

060 Set Reflex Decay Stimulus

Allows selection of stimuli based on valid stimuli for the current test. This command is valid during a Reflex Decay test as long as a stimulus is not being presented.

061Set Reflex Decay Intensity

Allows direct selection of intensity in 1 dB steps in current valid intensity range. This command is valid during a Reflex Decay test as long as a stimulus is not being presented.

062 Set ARLT Stimulus Ear

Allows the Stimulus ear parameter to be selected remotely. This command is valid in the ARLT test mode.

063 Set ARLT Stimulus On-Time

Allows direct selection of the On-Time parameter in msec under the constraints of the defined increments and range for the test. This command is valid in the ARLT test mode as long as a stimulus is not being presented.

064 Set ARLT Auto Zero

Used to change the Auto Zero parameter (ON or OFF). This command is valid in the ARLT test mode.

065 Set ARLT ml Scale

Used to change the scale of the Reflex plot. This command is valid in the ARLT test mode.

066 ARLT Ear Toggle

Used to toggle between Left and Right Ear. This command is only valid in the ARLT test mode.

067Set ARLT Admittance

Used to change the Admittance parameter. This command is only valid in the ARLT test mode. Any change that occurs due to a change in Admittance changes immediately as if the change was made navigating the menus.

068 Set ARLT Timebase

Allows direct selection of timebase. Instead of using arrows like the softkeys, an integer is used to select one of the 4 possible timebases (500ms, 1000ms, 1500ms, 2000ms). This command is valid in the ARLT test mode.

069 Set ARLT Step size

Allows the user to remotely change the step-size, which controls the increments for the probe intensity. This command is valid in the ARLT test mode.

070 Set ARLT Average

Allows selection of the number of presentations to be averaged in the standard increment and range. This command is valid during an ARLT test as long as a stimulus is not being presented.

071 Set ARLT Cursor

Allows the cursor to be moved to a specified X-axis position when the cursor is active. This command is valid in ARLT as long as a tone is not being processed and there is already data plotted.

072 Set ARLT Stimulus

Allows selection of stimuli based on valid stimuli for the current test. This command is valid during an ARLT test as long as a stimulus is not being presented.

073 Set ARLT Intensity

Allows direct selection of intensity in 1 dB steps in current valid intensity range. This command is valid during an ARLT test as long as a stimulus is not being presented.

074Set A.R. Sensitization Stimulus Ear

Allows the Stimulus ear parameter to be selected remotely. This command is valid in the A.R. Sensitization test mode.

075 Set A.R. Sensitization Stimulus Timing

Allows direct selection of timing (ON Time, OFF Time and Quantity) parameters in msec in the defined increments and range for the test. This command is valid in the A.R. Sensitization test mode as long as a stimulus is not being presented.

076 Set A.R. Sensitization Auto Zero

Used to change the Auto Zero parameter (ON or OFF). This command is valid in the A.R. Sensitization test mode.

077 Set A.R. Sensitization ml Scale

Used to change the scale of the A.R. Sensitization plot. This command is valid in the A.R. Sensitization test mode.

078 A.R. Sensitization Ear Toggle

Used to toggle between Left and Right Ear. This command is only valid in the A.R. Sensitization test mode.

079 Set A.R. Sensitization Admittance

Used to change the Admittance parameter. This command is only valid in the A.R. Sensitization test mode. Any change of test or screen appearance that occurs due to a change in Admittance changes immediately as if the change was made navigating the menus.

080 Set A.R. Sensitization Timebase

Allows direct selection of timebase. Instead of using arrows like the softkeys, an integer is used to select one of the 8 possible timebases (1.5s, 3.0s, 4.5s, 6.0s, 7.5s, 9.0s, 10.5s, and 12.0s). This command is valid in the A.R. Sensitization test mode.

081 Set A.R. Sensitization Step size

Allows the user to remotely change the step-size, which controls the increments for the probe intensity. This command is valid in the A.R. Sensitization test mode.

082 Set A.R. Sensitization Facilitator

Allows direct selection of the facilitator values for intensity in 1 dB steps and for the stimulus. These selections will be valid depending on the current test. This command is valid during an A.R. Sensitization test as long as a stimulus is not being presented.

083 Set A.R. Sensitization Cursor

Allows the cursor to be moved to a specified X-axis position when the cursor is active. This command is valid in A.R. Sensitization as long as a tone is not being processed and there is already data plotted.

084 Set A.R. Sensitization Stimulus

Allows selection of stimuli based on valid stimuli for the current test. This command is valid during an A.R. Sensitization test as long as a stimulus is not being presented.

085 Set A.R. Sensitization Intensity

Allows direct selection of intensity in 1 dB steps in current valid intensity range. This command is valid during an A.R. Sensitization test as long as a stimulus is not being presented.

086 Set Multiple Hz #1 Pressure Range

Used to change the Pressure range between Normal and Wide. This command is only valid in the Multiple Hz #1 screen.

087 Set Multiple Hz #1 Pressure Rate

Used to modify the Pressure rate parameter. This command is only valid on the Multiple Hz screen #1.

088 Set Multiple Hz #1 Start Pressure

Used to modify the Start Pressure parameter. This command is only valid on the Multiple Hz screen #1.

089 Set Multiple Hz #1 Delta Plot

Used to change the Admittance parameter for screen #2. This command is only valid in Multiple Hz screen #1.

090 Multiple Hz #1 Ear Toggle

Used to toggle between Left and Right Ear. This command is only valid on the Multiple Hz #1 screen.

091Set Multiple Hz #1 Cursor

Allows the cursor to be moved to a specified X-axis position and for a peak to be selected when the cursor is active. This command is valid following the completion of Multiple Hz screen #1.

092 Multiple Hz #1 Continue

Processes the continue softkey following the completion of a Multiple Hz screen #1 test. This can only be used when the continue softkey is displayed.

093 Multiple Hz #2 Continue

Processes the continue softkey following the completion of a Multiple Hz screen #2 test. This can only be used when the continue softkey is displayed.

094 Set Multiple Hz #2Cursor

Allows the cursor to be moved to a specified X-axis position and for a probe tone to be selected when the cursor is active. This command is valid following the completion of Multiple Hz screen #2.

095 Set Multiple Hz #3 Probe Hz

Allows selection of the probe tone from Multi Hz #2 in the standard increment and range. This command is valid during a Multiple Frequency Screen #3 test when a Tymp is not in progress.

096 Set Multiple Hz #3 Cursor

Allows the cursor to be moved to a specified X-axis position and for a peak to be selected when the cursor is active. This command is valid following the completion of Multiple Hz screen #3.

097 Multiple Hz #3 Continue

Processes the continue softkey on the Multiple Hz screen #3 menu. This command will cause a test to be started and data to be plotted. This can only be used when the continue softkey is diaplayed.

098 Set Multiple Hz #3 Admittance

Used to change the Admittance parameter. This command is only valid on the Multiple Hz screen #3. Any other changes that result in a change in Admittance changes immediately as if the change was made navigating the menus.

099 Set Multiple Hz #3 Pressure Range

Used to change the Pressure range between Normal and Wide. This command is only valid in the Multiple Hz #3 screen.

100 Set Multiple Hz #3 Pressure Rate

Used to modify the Pressure rate parameter. This command is only valid on the Multiple Hz screen #1.

101 Set Multiple Hz #3 Start Pressure

Used to modify the Start Pressure parameter. This command is only valid on the Multiple Hz screen #3.

102 Patient Name

Allows the entry of the patient name via the Remote system. The field is still limited to 45 characters and is limited to the same valid character set as if the patient name was being entered from the keyboard. This command is valid when the cursor is active.

103 Patient ID

Allows the entry of the patient ID via the Remote system. The field is still limited to 45 characters and is limited to the same valid character set as if the patient ID was being entered from the keyboard. This command is valid when the cursor is active.

104 Tester Name

Allows the entry of the tester name via the Remote system. The field is still limited to 45 characters and is limited to the same valid character set as if the tester name was being entered from the keyboard. This command is valid when the cursor is active.

105 Facility Name

Allows the entry of the facility name via the Remote system. The field is still limited to 45 characters and is limited to the same valid character set as if the tester name was being entered from the keyboard. This command is valid when facility name is selected from Instrument options and the cursor is active.

106 Print Tests

Allows the printing of a single test or all tests. The desired test to be printed will be selected in the remote record. This command is valid when in Page mode.

107 Clear Tests

Allows the clearing of a single test or all tests. The desired test to be cleared will be selected in the remote record. This command is valid when in Page mode.

108 Set Print Format Command

Provides to the TympStar the format of the printout. This command is valid under Instrument Options. The print format can be changed for all test modes (except A.R. Sensi) between Tabular and Graphical.

109 Set External Printer Settings

Provides to the TympStar the format of the external printer printout. The External Printer parameters (Left column setting and Print Type) are changed remotely with this command code.

110 Set Data Transfer Settings

Provides to the TympStar the format of the transferred data. This command is valid under Instrument Options. The Data Transfer format can be changed for all tests between summary and summary plus graphics. The clear test parameter can also be modified using this command.

111 Set Language

Used to process a language change for either the LCD and printer or the keyboard. The language choices will match the softkey choices (English, French, German, Spanish and Italian). This command is valid only in Instrument Options.

112 Set Test Sequence Setting Reflex Threshold

Used to setup the Test sequence for Auto Sequence testing. This command controls the Reflex Threshold settings. This command is valid only in Instrument Options

113 Set Test Sequence Setting Reflex Decay

Used to setup the Test sequence for Auto Sequence testing. This command controls the Reflex Decay settings. This command is valid only in Instrument Options

114 Set Remote Settings

Allows the Remote Settings (Baud Rate, Parity, Stop bits, and RTS/CTS) to be queried using the remote system.

115 Date/Time Formats

Used to adjust Date and time formats. This command is valid only in Instrument Options.

116 Set Date Command

Used to adjust the Date (month, day, year). This command is valid only in Instrument Options

117 Set Time Command

Used to adjust the Time (hour, minute). This command is valid only in Instrument Options

118 Transmit Current XY Data Request Command

Allows the Remote Device to get current values of the current Y axis and X axis quantities or other values for the current unit mode. This record is not valid during a Multiple Frequency Screen #2 test. This command is valid at all times except during Screen #2 of a Multiple Frequency test.

119 Transmit Test Data Request Command

Allows the Remote Device to get the test data for the specified test in the specified format. This command is valid in all tests as long as the test is not in progress or a stimulus is being presented.

120 Record Received OK Acknowledgement – ACK

Indicates to the GSI TympStar that the record just transmitted to the Remote Device was received correctly. This record is valid in all tests after the GSI TympStar has transmitted data to the Remote Device.

121 Record Received Incorrectly Acknowledgement – NAK

Indicates to the GSI TympStar that the record just transmitted to the Remote Device was received incorrectly. This record is valid in all tests after the GSI TympStar has transmitted data to the Remote Device

6.2.1 Input Records

For the detailed Input record formats see Section 8.

7 Output Record Formats

- X = ASCII character representing the particular value being defined.
- All compliance values are transmitted as (Compliance x 1000). For example a transmitted value of 1234 equals 1.234 ml or mmho.
- All Gradient values are transmitted as (Gradient x 100).

7.1 Summary Data Records

7.1.1 Tymp Diagnostic

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	0 = Tymp Diagnostic
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	1	Auto Sequence	0 = Off 1 = On
218	2	ProbeTone	0 = 226Hz 1 = 678 Hz 2 = 1000 Hz 3 —> 38 = Not used
220	4	Start Pressure	+/-xxx -600 to +400 daPa
224	1	Baseline Status	0 = Off 1 = On
225	1	Gradient Status of last Tymp run	0 = Off 1 = Tymp Width daPa 2 = Ratio ml
226	6	ECV/Cl data	+/-xxxxx -30800 to +30800
232	1	Number of lines	0, 1, 2 or 3

233	1	Y axis scale	0 = -0.5 to +1.5 1 = -0.5 to +3.0 2 = -0.5 to +5.0 3 = -1.0 to +7.0 4 = -1.0 to +9.0 5 = -2.5 to +15.0 6 = -5.0 to +25.0 7 = -5.0 to +35.0
234	5	Cursor X value	+/-xxxx -600 to +400 daPa "——" if Cursor not used
239	2	Line 1 data header	"L1"
241	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800 "——" if Cursor not used
247	1	Admittance status	0 = Y 1 = B 2 = G 3 = B/G
248	1	Pressure Range status	0 = Normal 1 = Wide
249	1	Pressure Rate status	0 = 12.5 daPa/sec 1 = 50 daPa/sec 2 = 200 daPa/sec 3 = 600/200 daPa/sec
250	6	Peak Compliance data	+/-xxxxx -30800 to +30800 "———" if no Peak found
256	4	Peak Pressure data	+/-xxx -600 to +400 daPa "——" if no Peak found
260	1	Sweep Direction status	0 = positive to negative 1 = negative to positive
261	3	Gradient data	If Gradient = "RATIO": xxx 1 to 999 daPa If Gradient = "TYMP WIDTH": xxxx +00 to +990 " 0" if Gradient could not be calculated. "—" if Gradient Status = OFF
264	2	Line 2 data header	"L2"
266	6	Line 2 cursor Y value	+/ -xxxxx -30800 to +30800 "———" if Cursor not used
272	1	Admittance status	0 = Y 1 = B 2 = G 3 = B/G
273	1	Pressure Range status	0 = Normal 1 = Wide
274	1	Pressure Rate status	0 = 12.5 daPa/sec 1 = 50 daPa/sec 2 = 200 daPa/sec 3 = 600/200 daPa/sec
275	6	Peak Compliance data	+/-xxxxx -30800 to +30800 "———" if no Peak
281	4	Peak Pressure data	+/-xxx -600 to +400 daPa "——" if no Peak
285	1	Sweep Direction status	0 = positive to negative 1 = negative to positive

286	3	Gradient data	If Gradient = "RATIO": xxx 1 to 999 daPa If Gradient = "TYMP WIDTH": xxxx +00 to +990 " 0" if Gradient could not be calculated. "—" if Gradient Status = OFF
289	2	Line 3 data header	"L3"
291	6	Line 3 cursor Y value	+/-xxxxx -30800 to +30800 "———" if Cursor not used
297	1	Admittance status	0 = Y 1 = B 2 = G 3 = B/G
298	1	Pressure Range status	0 = Normal 1 = Wide
299	1	Pressure Rate status	0 = 12.5 daPa/sec 1 = 50 daPa/sec 2 = 200 daPa/sec 3 = 600/200 daPa/sec
300	6	Peak Compliance data	+/-xxxxx -30800 to +30800 "———" if no Peak
306	4	Peak Pressure data	+/-xxx -600 to +400 daPa "——" if no Peak
310	1	Sweep Direction status	0 = positive to negative 1 = negative to positive
311	3	Gradient data	If Gradient = "RATIO": xxx 1 to 999 daPa If Gradient = "TYMP WIDTH": xxxx +00 to +990 " 0" if Gradient could not be calculated. "—" if Gradient Status = OFF
314	2	Checksum	xx
316	1	Carriage return	"CR"
317	1	Line Feed	"LF"

7.1.2 Tymp Screening

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	1 = Tymp Screening
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	2	ProbeTone	0 = 226Hz
219	4	Start Pressure	+/-xxx -600 to +400 daPa
223	1	Baseline Status	0 = Off 1 = On
224	1	Gradient Status	0 = Off 1 = Tymp Width daPa 2 = Ratio ml
225	6	ECV/Cl data	+/-xxxxx -30800 to +30800
231	1	Number of lines	0 or 1
232	1	Y axis scale	0 = -0.5 to +1.5 1 = -0.5 to +3.0 2 = -0.5 to +5.0 3 = -1.0 to +7.0 4 = -1.0 to +9.0 5 = -2.5 to +15.0 6 = -5.0 to +25.0 7 = -5.0 to +35.0
233	5	Cursor X value	+/-xxx -600 to +400 daPa "——" if Cursor not used
238	2	Line 1 data header	"L1"
240	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800 "———" if Cursor not used
246	1	Admittance status	0 = Y
247	1	Pressure Range status	0 = Normal 1 = Wide
248	1	Pressure Rate status	0 = Not used 1 = Not used 2 = 200 daPa/sec 3 = 600/200 daPa/sec

249	6	Peak Compliance data	+/-xxxxx -30800 to +30800 "———" if no Peak
255	4	Peak Pressure data	+/-xxx -600 to +400 daPa "——" if no Peak
259	1	Sweep Direction status	0 = positive to negative 1 = negative to positive
260	3	Gradient data	If Gradient = "RATIO": xxx 1 to 999 daPa If Gradient = "TYMP WIDTH": xxxx +00 to +990 " 0" if Gradient could not be calculated. "—" if Gradient Status = OFF
263	1	Reflex Type status	0 = Off 1 = Ipsi 2 = Contra 3 = Ipsi. and Contra
264	1	Reflex Frequency #1	0 = 500 Hz 1 = 1000 Hz 2 = 2000 Hz 3 = 4000 Hz "-" if Reflex Type = Off
265	1	Reflex Frequency #2	0 = 500 Hz 1 = 1000 Hz 2 = 2000 Hz 3 = 4000 Hz "—" = If Reflex Type = Off or Ipsi and Contra
266	1	Auto Start status	0 = Off 1 = On
267	1	Reflex #1 data	0 = NA 1 = NT 2 = NR 3 = YES 4 = NT <> 5 = NR <> 6 = NT CAL "—" if Reflex Type = Off
268	1	Reflex #2 data	0 = NA 1 = NT 2 = NR 3 = YES 4 = NT <> 5 = NR <> 6 = NT CAL "—" if Reflex Type = Off or if 2nd frequency not selected
269	2	Checksum	xx
271	1	Carriage return	"CR"
272	1	Line Feed	"LF"

7.1.3 Reflex Threshold

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	2 = Reflex Threshold
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	1	Auto Sequence	0 = Off 1 = On
218	2	ProbeTone	0 = 226Hz 1 = 678 Hz 2 = 1000 Hz
220	5	Timebase	xxxxx 15000 to 60000 msec
225	1	Number of lines	0, 1 or 2
226	1	Y axis scale	0 = +.04 to -16 1 = +.08 to -.32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.16 6 = -.08 to +.32 7 = -.12 to +48 8 = -.16 to +.64 9 = -.20 to +.80
227	5	Cursor X value	xxxxx 0 to 60000 msec "——" if Cursor not used
232	2	Line 1 data header	"L1"
234	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800 "———" if Cursor not used
240	1	Admittance status	0 = Y 1 = B 2 = G
241	1	Stimulus Ear status	0 = IPSI 1 = Steady CONTRA 2 = Pulsed CONTRA
242	1	Timing - Manual/Auto	0 = Manual 1 = Automatic

243	5	On Time	xxxxx 1000 to 54000 msec "——" if Manual Timing
248	5	Of f Time	xxxxx 0 to 52000 msec "——" if Manual Timing
253	2	Zero field	"—"
255	1	Threshold Seek	0 = Off 1 = On
256	3	Min. Change	x.xx .02 to 0.8
259	3	Start dBHL	xxx 35 to 120 dB
262	3	Stop dBHL	xxx 35 to 110 dB
265	2	Zero field	"—"
267	2	Activator Stimulus	0 = 250 Hz 1 =500 Hz 2 = 1000 Hz 3 = 2000 Hz 4 = 4000 Hz 5 = Low Band Noise 6 = High Band Noise 7 = Broad band Noise 8 = Click 9 = External 10 = Non Acoustic 11 = Not used
269	3	Click Rate	xxx 50 to 300
272	2	Zero field	"—"
274	4	Pressure	+/-xxx -600 to +400 daPa
278	1	Number of traces	0 to 7
279	1	Intensity unit	0 = HL 1 = HL* 2 = SPL
280	3	Trace 1 intensity	xxx 35 to 120 dB
283	6	Trace 1 amplitude	+/-xxxxx -30800 to +30800
289	3	Trace 2 intensity	xxx 35 to 120 dB
292	6	Trace 2 amplitude	+/-xxxxx -30800 to +30800
298	3	Trace 3 intensity	xxx 35 to 120 dB
301	6	Trace 3 amplitude	+/-xxxxx -30800 to +30800
307	3	Trace 4 intensity	xxx 35 to 120 dB
310	6	Trace 4 amplitude	+/-xxxxx -30800 to +30800
316	3	Trace 5 intensity	xxx 35 to 120 dB
319	6	Trace 5 amplitude	+/-xxxxx -30800 to +30800
325	3	Trace 6 intensity	xxx 35 to 120 dB
328	6	Trace 6 amplitude	+/-xxxxx -30800 to +30800
334	3	Trace 7 intensity	xxx 35 to 120 dB
337	6	Trace 7 amplitude	+/-xxxxx -30800 to +30800
343	2	Trace Mark	0 to 7
345	2	Trace Type	0 = NR 1 = * 2 = NR + TS 3 = * + TS
347	2	Zero field	"—"
349	2	Line 2 data header	"L2"
351	6	Line 2 cursor Y value	+/-xxxxx -30800 to +30800 " —— " if Cursor not used

357	1	Admittance status	0 = Y 1 = B 2 = G
358	1	Stimulus Ear status	0 = IPSI 1 = Steady CONTRA 2 = Pulsed CONTRA
359	1	Timing - Manual/Auto	0 = Manual 1 = Automatic
360	5	On Time	xxxxx 1000 to 54000 msec "——" if Manual Timing
365	5	Off Time	xxxxx 0 to 52000 msec "——" if Manual Timing
370	2	Zero field	"—"
372	2	Activator Stimulus	0 = 250 Hz 1 = 500 Hz 2 = 1000 Hz 3 = 2000 Hz 4 = 4000 Hz 5 = Low Band Noise 6 = High Band Noise 7 = Broad band Noise 8 = Click 9 = External 10 = Non Acoustic 11 = Not used
374	3	Click Rate	xxx 50 to 300
377	2	Zero field	"—"
379	4	Pressure	+/-xxx -600 to +400 daPa
383	1	Number of traces	0 to 7
384	1	Intensity unit	0 = HL 1 = HL* 2 = SPL
385	3	Trace 1 intensity	xxx 35 to 120 dB
388	6	Trace 1 amplitude	+/-xxxxx -30800 to +30800
394	3	Trace 2 intensity	xxx 35 to 120 dB
397	6	Trace 2 amplitude	+/-xxxxx -30800 to +30800
403	3	Trace 3 intensity	xxx 35 to 120 dB
406	6	Trace 3 amplitude	+/-xxxxx -30800 to +30800
412	3	Trace 4 intensity	xxx 35 to 120 dB
415	6	Trace 4 amplitude	+/-xxxxx -30800 to +30800
421	3	Trace 5 intensity	xxx 35 to 120 dB
424	6	Trace 5 amplitude	+/-xxxxx -30800 to +30800
430	3	Trace 6 intensity	xxx 35 to 120 dB
433	6	Trace 6 amplitude	+/-xxxxx -30800 to +30800
439	3	Trace 7 intensity	xxx 35 to 120 dB
442	6	Trace 7 amplitude	+/-xxxxx -30800 to +30800
448	2	Trace Mark	0 to 7
450	2	Trace Type	0 = NR 1 = * 2 = NR + TS 3 = * + TS
452	2	Zero field	"—"
454	2	Checksum	xx

456	1	Carriage return	"CR"
457	1	Line Feed	"LF"

7.1.4 ETF — Intact TM

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
293	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	4 = ETF - Intact TM
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	2	Probe Tone	0 = 226Hz 1 = 678 Hz 2 = 1000 Hz 3 —> 38 = Not used
219	4	Start Pressure	+/-xxx -600 to +400 daPa
223	1	Baseline Status	0 = Off 1 = On
224	1	Gradient Status	0 = Off
225	6	ECV/CI data	+/-xxxxx -30800 to +30800
231	1	Number of lines	0, 1, 2 or 3
232	1	Y axis scale	0 = -0.5 to +1.5 1 = -0.5 to +3.0 2 = -0.5 to +5.0 3 = -1.0 to +7.0 4 = -1.0 to +9.0 5 = -2.5 to +15.0 6 = -5.0 to +25.0 7 = -5.0 to +35.0
233	5	Cursor X value	+/-xxxx -600 to +400 daPa "——" if Cursor not used
238	2	Line 1 data header	"L1"
240	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800 "———" if Cursor not used

246	1	Admittance status	0 = Y 1 = B 2 = G
247	1	Pressure Range status	0 = Normal 1 = Wide
248	1	Pressure Rate status	0 = 12.5 daPa/sec 1 = 50 daPa/sec 2 = 200 daPa/sec 3 = 600/200 daPa/sec
249	6	Peak Compliance data	+/-xxxxx -30800 to +30800 "———" if no Peak
255	4	Peak Pressure data	+/-xxx -600 to +400 daPa "——" if no Peak
259	1	Sweep Direction status	0 = positive to negative 1 = negative to positive
260	3	Zero field	"—"
263	2	Line 2 data header	"L2"
265	6	Line 2 cursor Y value	+/-xxxxx -30800 to +30800 "———" if Cursor not used
271	1	Zero field	"-"
276	1	Zero field	"-"
277	1	Zero field	"-"
278	6	Peak Compliance data	+/-xxxxx-30800 to +30800 "—— " if no Peak
284	4	Peak Pressure data	+/-xxx -600 to +400 daPa "——" if no Peak
288	1	Zero field	"-"
289	3	Zero field	"—"
292	2	Line 3 data header	"L3"
294	6	Line 3 cursor	V value +/-xxxxx-30800 to+30800 "———" if Cursor not used
300	1	Zero field	"-"
301	1	Zero field	"-"
302	1	Zero field	"-"
303	6	Peak Compliance data	+/-xxxxx -30800 to +30800 "———" if no Peak
309	4	Peak Pressure data	+/-xxx -600 to +400 daPa "——" if no Peak
313	1	Zero field	"-"
314	3	Zero field	"—"
317	2	Checksum	xx
319	1	Carriage return	"CR"
320	1	Line Feed	"LF"

7.1.5 ETF — Perforated TM

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99

4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	5 = ETF - Perforated TM
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	5	Timebase	xxxxx 30000 to 60000 msec
222	4	Maximum Pressure	+/—xxx -600 to +400 daPa
226	4	Open Pressure #1	+/-xxx -600 to +400 daPa "——" if value unavailable or test not started
230	4	Close Pressure #1	+/-xxx -600 to +400 daPa "——" if value unavailable or test not started
234	4	Open Pressure #2	+/-xxx -600 to +400 daPa "——" if value unavailable or test not started
238	4	Close Pressure #2	+/-xxx -600 to +400 daPa "——" if value unavailable or test not started
242	4	Open Pressure #3	+/-xxx -600 to +400 daPa "——" if value unavailable or test not started
246	4	Close Pressure #3	+/-xxx -600 to +400 daPa "——" if value unavailable or test not started
250	1	Y axis scale	0 = -600 to -50 daPa 1 = +400 to +50 daPa "-" if test not started
251	5	Cursor X value	xxxxx 0 to 60000 sec "———" if Cursor not used or test not started
256	6	Cursor Y value	+/-xxxxx -600 to +400 daPa "———" if Cursor not used or test not started
262	2	Checksum	xx
264	1	Carriage return	"CR"
265	1	Line feed	"L"

7.1.6 Reflex Decay

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	6 = Reflex Decay
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	1	Auto Sequence	0 = Off 1 = On
218	2	ProbeTone	0 = 226Hz 1 = 678 Hz 2 = Not used 3 —> 38 = Not used
220	5	Timebase	xxxxx 15000 to 60000 msec
225	1	Number of lines	0, 1, or 2
226	1	Y axis scale	0 = +.04 to -.16 1 = +.08 to -.32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.16 6 = -.08 to +.32 7 = -.12 to +.48 8 = -.16 to +.64 9 = -.20 to +.80
227	5	Cursor X value	xxxxx 0 to 60000 msec "——" if Cursor not used
232	2	Line 1 data header	"L1"
234	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800
240	1	Admittance status	0 = Y 1 = B 2 = G
241	1	Stimulus Ear status	0 = IPSI 1 = Steady CONTRA
242	1	Zero field	"-"
243	5	On Time	xxxxx 1000 to 54000 msec
248	5	Zero field	"——"

253	2	Zero field	"__"
255	2	Activator Stimulus	0 = Not used 1 = 500 Hz 2 = 1000 Hz 3 = 2000 Hz 4 = 4000 Hz 5 = Low Band Noise 6 = High Band Noise 7 = Broad band Noise 8 = Click 9 = External 10 = Not used 11 = Not used
257	3	Click rate	xxx 50 to 300/sec
260	2	Zero field	"__"
262	4	Pressure	+/-xxx -600 to +400 daPa
266	1	Number of traces	0 or 1
267	1	Intensity unit	0 = HL 1 = HL* 2 = SPL
268	3	Trace 1 intensity	xxx 35 to 120 dB
271	6	Trace 1 amplitude	+/-xxxxx -30800 to +30800
277	5	50% Decay time	xxxxx 1000 to 54000 msec " NA" if value unavailable " NO" if 50% point not found
282	5	Zero field	"____"
287	5	Zero field	"____"
292	5	Zero field	"____"
297	2	Line 2 data header	"L2"
299	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800 "_____ " if Cursor not used
305	1	Admittance status	0 = Y 1 = B 2 = G
306	1	Stimulus Ear status	0 = IPSI 1 = Steady CONTRA
307	1	Zero field	"-"
308	5	On Time	xxxxx 1000 to 54000 msec
313	5	Zero field	"____ "
318	2	Zero field	"__"
320	2	Activator Stimulus	0 = Not used 1 = 500 Hz 2 = 1000 Hz 3 = 2000 Hz 4 = 4000 Hz 5 = Low Band Noise 6 = High Band Noise 7 = Broad band Noise 8 = Click 9 = External 10 = Not used 11 = Not used
322	3	Click Rate	xxx 50 to 300/sec
325	2	Zero field	"__"
327	4	Pressure	+/-xxx -600 to +400 daPa

331	1	Number of traces	0 or 1
332	1	Intensity unit	0 = HL 1 = HL* 2 = SPL
333	3	Trace 1 intensity	xxx 35 to 120 dB
336	6	Trace 1 amplitude	+/-xxxxx -30800 to +30800
342	5	50% decay time	xxxxx 1000 to 54000 msec " NA" if value unavailable " NO" if 50% point not found
347	5	Zero field	"____"
352	5	Zero field	"____"
357	5	Zero field	"____"
362	2	Checksum	xx
364	1	Carriage return	"CR"
365	1	Line Feed	"LF"

7.1.7 ARLT

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	7 = ARLT
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	2	Probe Tone	0 = 226Hz
219	5	Timebase	xxxxx 500 to 2000 msec
224	1	Number of lines	0, 1, or 2
225	1	Y axis scale	0 = +.04 to -.16 1 = +.08 to - .32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.16 6 = -.08 to +.32

			7 = -.12 to +.48
			8 = -.16 to +.64
			9 = -.20 to +.80
226	5	Cursor X value	xxxxx 0 to 1800 msec
			"—— " if Cursor not used
231	2	Line 1 data header	"L1"
233	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800
			" —— " if Cursor not used
239	1	Admittance status	0 = Y
			1 = B
			2 = G
240	1	Stimulus Ear status	0 = IPSI
			1 = Steady CONTRA
241	1	Zero field	"-"
242	5	On Time	xxxxx 100 to 1800 msec
247	5	Zero field	"—— "
252	2	Number Averaged	"—" 0 to 50 0 = OFF
254	2	Activator Stimulus	0 = Not used
			1 = 500 Hz
			2 = 1000 Hz
			3 = 2000 Hz
			4 = 4000 Hz
			5 = Low Band Noise
			6 = High Band Noise
			7 = Broad band Noise
			8 = Click
			9 = External
			10 = Not used
			11 = Not used
256	3	Click rate	xxx 50 to 300/sec
259	2	Zero field	"—"
261	4	Pressure	+/-xxx -600 to +400 daPa
265	1	Number of traces	0 or 1
266	1	Intensity unit	0 = HL
			1 = HL*
			2 = SPL
267	3	Trace 1 intensity	xxx 35 to 120 dB
270	6	Trace 1 amplitude	+/-xxxxx-30800 to +30800
276	5	10% ON time	xxxxx 0 to 1800 msec
			" NA" if value unavailable
281	5	90% ON time	xxxxx 0 to 1800 msec
			" NA" if value unavailable
286	5	10% OFF time	xxxxx 0 to 1800 msec
			" NA" if value unavailable
291	5	90% OFF time	xxxxx 0 to 1800 msec
			" NA" if value unavailable
296	2	Line 2 data header	"L2"
298	6	Line 2 cursor Y value	+/-xxxxx -30800 to +30800
			" ——— " if Cursor not used
304	1	Admittance status	0 = Y
			1 = B
			2 = G
305	1	Stimulus Ear status	0 = IPSI
			1 = Steady CONTRA
306	1	Zero field	"-"

307	5	On Time	xxxxx 100 to 1800 msec
312	5	Zero field	"——— "
317	2	Zero field	"—"
319	2	Activator Stimulus	0 = Not used 1 = 500 Hz 2 =1000 Hz 3 = 2000 Hz 4 = 4000 Hz 5 = Low Band Noise 6 = High Band Noise 7 = Broad band Noise 8 = Click 9 = External 10 = Not used 11 = Not used
321	3	Click rate	xxx 50 to 300/sec
324	2	Zero field	"—"
326	4	Pressure	+/-xxx -600 to +400 daPa
330	1	Number of traces	0 or 1
331	1	Intensity unit	0 = HL 1 = HL* 2 = SPL
332	3	Trace 1 intensity	xxx 35 to 120 dB
335	6	Trace 1 amplitude	+/-xxxxx -30800 to +30800
341	5	10% ON time	xxxxx 0 to 1800 msec " NA" if value unavailable
346	5	90% ON time	xxxxx 0 to 1800 msec " NA" if value unavailable
351	5	10% OFF time	xxxxx 0 to 1800 msec " NA" if value unavailable
356	5	90% OFF time	xxxxx 0 to 1800 msec " NA" if value unavailable
361	2	Checksum	xx
363	1	Carriage return	"CR"
364	1	Line Feed	"LF"

7.1.8 Acoustic Reflex Sensitization

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters

184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	8 = ARST
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	2	ProbeTone	0=226Hz 1 = Not used 2 = Not used 3 —> 38 = Not used
219	5	Timebase	xxxxx 1500 to 12000 msec
224	1	Number of lines	0, 1 or 2
225	1	Y axis scale	0 = +.04 to -.16 1 = +.O8 to -.32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.I6 6 = -.08 to +.32 7 = -.12 to +.48 8 = -.16 to +.64 9 = -.20 to +.8O
226	5	Cursor X value	xxxxx 0 to 10800 msec "——" if Cursor not used
231	2	Line 1 data header	"L1"
233	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800 "———" if Cursor not used
239	1	Admittance status	0 = Y 1 = B 2 = G
240	1	Stimulus Ear status	0 = IPSI 1 = Steady CONTRA 2 = Not used 3 = Cfla 4 = CfCa 5 = IfCa 6 = Ifla
241	1	Timing - Manual/Auto	0 = Manual 1 = Automatic
242	5	On Time	xxxxx 125 to 10500 msec "——" if Manual Timing
247	5	Off Time	xxxxx 0 to 10000 msec 0.0 to 10.0 sec "——" if Manual Timing
252	2	Zero field	"—"
254	2	Activator Stimulus	0 = Not used 1 = 500 Hz 2 = 1000 Hz 3 = 2000 Hz 4 = 4000 Hz 5 = Not used 6 = Not used 7 = Broad band Noise

			8 = Not used 9 = External 10 = Not used 11 = 6000 Hz
256	3	Facilitator Intensity	xxx 35 to 120 dB "—" if Stimulus Ear = Ipsi or Contra
259	2	Facilitator Stimulus	0 = Not used 1 = 500 Hz 2 = 1000 Hz 3 = 2000 Hz 4 = 4000 Hz 5 = Not used 6 = Not used 7 = Broad band Noise 8 = Not used 9 = External 10 = Not used 11 = 6000 Hz "—" if Stimulus Ear = Ipsi or Contra
261	4	Pressure	+/-xxx -600 to +400 daPa
265	1	Number of traces	0 to 7
266	1	Intensity unit	0 = HL 1 = HL* 2 = SPL
267	3	Trace 1 intensity	xxx 35 to 120 dB
270	6	Trace 1 amplitude	+/-xxxxx -30800 to +30800
276	3	Trace 2 intensity	xxx 35 to 120 dB
279	6	Trace 2 amplitude	+/-xxxxx -30800 to +30800
285	3	Trace 3 intensity	xxx 35 to 120 dB
288	6	Trace 3 amplitude	+/-xxxxx -30800 to +30800
294	3	Trace 4 intensity	xxx 35 to 120 dB
297	6	Trace 4 amplitude	+/-xxxxx -30800 to +30800
303	3	Trace 5 intensity	xxx 35 to 120 dB
306	6	Trace 5 amplitude	+/-xxxxx -30800 to +30800
312	3	Trace 6 intensity	xxx 35 to 120 dB
315	6	Trace 6 amplitude	+/-xxxxx -30800 to +30800
321	3	Trace 7 intensity	xxx 35 to 120 dB
323	6	Trace 7 amplitude	+/-xxxxx -30800 to +30800
329	2	Line 2 data header	"L2"
331	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800 "——— " if Cursor not used
337	1	Admittance status	0 = Y I = B 2 = G
338	1	Stimulus Ear status	0 = IPSI I = Steady CONTRA 2 = Not used 3 = Cfla 4 = CfCa 5 = IfCa 6 = Ifla
339	1	Timing - Manual/Auto	0 = Manual 1 = Automatic

340	5	On Time	xxxxx 125 to 10500 msec "——" if Manual Timing
345	5	Off Time	xxxxx 0 to 10000 msec 0.0 to 10.0 sec "—— " if Manual Timing
350	2	Zero field	"—"
352	2	Activator Stimulus	0 = Not used 1 = 500 Hz 2 = 1000 Hz 3 = 2000 Hz 4 = 4000 Hz 5 = Not used 6 = Not used 7 = Broad Band Noise 8 = Not used 9 = External 10 = Not used 11 = 6000 Hz
354	3	Facilitator Intensity	xxx 35 to 120 dB "—" if Stimulus Ear = Ipsi or Contra
357	2	Facilitator Stimulus	0 = Not used 1 = 500 Hz 2 = 1000 Hz 3 = 2000 Hz 4 = 4000 Hz 5 = Not used 6 = Not used 7 = Broad band Noise 8 = Not used 9 = External 10 = Not used 11 = 6000 Hz "—" if Stimulus Ear = Ipsi or Contra
359	4	Pressure	+/-xxx -600 to +400 daPa
363	1	Number of traces	0 to 7
364	1	Intensity Unit	0 = HL 1 = HL* 2 = SPL
365	3	Trace 1 intensity	xxx 35 to 120 dB
368	6	Trace 1 amplitude	+/-xxxxx -30800 to +30800
374	3	Trace 2 intensity	xxx 35 to 120 dB
377	6	Trace 2 amplitude	+/-xxxxx -30800 to +30800
383	3	Trace 3 intensity	xxx 35 to 120 dB
386	6	Trace 3 amplitude	+/—xxxxx -30800 to +30800
392	3	Trace 4 intensity	xxx 35 to 120 dB
395	6	Trace 4 amplitude	+/-xxxxx -30800 to +30800
401	3	Trace 5 intensity	xxx 35 to 120 dB
404	6	Trace 5 amplitude	+/-xxxxx -30800 to +30800
410	3	Trace 6 intensity	xxx 35 to 120 dB
413	6	Trace 6 amplitude	+/-xxxxx -30800 to +30800
419	3	Trace 7 intensity	xxx 35 to 120 dB
422	6	Trace 7 amplitude	+/-xxxxx -30800 to +30800
428	2	Checksum	xx

430	1	Carriage return	"CR"
431	1	Line Feed	"LF"

7.1.9 Multiple Frequency - Screen #1

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	9 = Multiple Frequency Screen #1
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	2	ProbeTone	0 = 226Hz 1 = Not used 2 = Not used 3 —> 38 = Not Used
219	4	Start Pressure	+/-xxx -600 to +400 daPa
223	1	Baseline Status	0 = Off
224	1	Gradient Status	0 = Off
225	6	ECV/C1 data	+/-xxxxx -30800 to +30800
231	1	Number of lines	0 or 1
232	1	Y axis scale	0 = -0.5 to +1.5 1 = -0.5 to +3.0 2 = -0.5 to +5.0 3 = -1.0 to +7.0 4 = -1.0 to +9.0 5 = -2.5 to +15.0 6 = -5.0 to +25.0 7 = -5.0 to +35.0
233	5	Cursor X value	+/-xxxx -600 to +400 daPa "——" if Cursor not used
238	2	Line 1 data header	"L1"
240	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800 "———" if Cursor not used

246	1	Admittance status	0 = Y 1 = B 2 = G
247	1	Pressure Range status	0 = Normal 1 = Wide
248	1	Pressure Rate status	0 = 12.5 daPa/sec 1 = 50 daPa/sec 2 = 200 daPa/sec 3 = Not used
249	6	Peak Compliance data	+/-xxxxx -30800 to +30800 "———" if no Peak
255	4	Peak Pressure data	+/-xxx -600 to +400 daPa "——" if no Peak
259	1	Sweep Direction status	0 = positive to negative 1 = negative to positive
260	3	Gradient data	"—"
263	2	Checksum	xx
265	1	Carriage return	"CR"
266	1	Line Feed	"LF"

7.1.10 Multiple Frequency — Screen #2

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	10 = Multiple Frequency Screen #2
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear

217	2	Probe Tone/Resonance Frequency	0 = Not used 1 = Not used 2 = Not used 3 —> 38 = Frequency "NA" = Resonance frequency could not be determined. See Note.
219	4	Start Pressure	+/-xxx -600 to +400 daPa
223	1	Zero field	"-"
224	1	Zero field	"-"
225	6	Zero field	"——— "
231	1	Number of lines	0 or 2
232	2	Line 1 data header	"LI"
234	1	Admittance status	0 = Delta Y 1 = Delta B 2 = Delta G
235	6	Peak Compliance data	+/-xxxxx -30800 to +30800 "———" if no Peak
241	4	Peak Pressure data	+/-xxx -600 to +400 daPa "——" if no Peak
245	5	Cursor X data	xxxxx 250 to 2000 Hz "—— " if Cursor not used
250	1	Line 1 Y scale	0 = -3.0 to +3.0 1 = -7.5 to +7.5 2 = -15.0 to +15.0
251	6	Line 1 cursor Y value	+/-xxxxx -15000 to +15000 "——— " if Cursor not used
257	1	Line 2 Y scale	0 = +5 to -180 degrees 1 = +5 to -90 2 = +5 to -45
258	6	Line 2 cursor Y value	+/-xxxxx +5 to -180 degrees "———" if Cursor not used
264	2	Checksum	xx
266	1	Carriage return	"CR"
267	1	Line Feed	"LF"

NOTE

NOTE
Frequency in Hz = (Probe Tone value + 2) x 50

7.1.11 Multiple Frequency — Screen #3

Offset	# Chars	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	1 = Summary data record 8 = Summary data record with attached XY data records
2	2	Record Sequence Number	xx 00 to 99
4	45	Patient Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
49	45	Patient ID	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
94	45	Tester Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters

139	45	Facility Name	xxxxxxxxxxx 0 to 45 characters "-" for unused characters
184	9	Probe S/N	xxxxxxxxx 9 characters "-" for unused characters
193	20	Date/Time	xx/xx/xxxx xx:xx xm "—" for xm if 24 Hour time format
213	2	Test type	11 = Multiple Frequency Screen #3
215	1	Test number	1 to 9 and A to Q
216	1	Ear Under Test	"L" = Left Ear "R" = Right Ear
217	2	Probe Tone	0 = Not used 1 = Not used 2 = Not used 3 —> 38 = Frequency See Note.
219	4	Start Pressure	+/-xxx -600 to +400 daPa
223	1	Baseline Status	0 = Off
224	1	Gradient Status	0 = Off
225	6	ECV/CI data	+/-xxxxx -30800 to +30800
231	1	Number of lines	0 or 1
232	1	Y axis scale	0 = -0.5 to +1.5 1 = -0.5 to +3.0 2 = -0.5 to +5.0 3 = -1.0 to +7.0 4 = -1.0 to +9.0 5 = -2.5 to +15.0 6 = -5.0 to +25.0 7 = -5.0 to +35.0
233	5	Cursor X value	+/-xxxx -600 to +400 daPa "——" if Cursor not used
238	2	Line 1 data header	"L1"
240	6	Line 1 cursor Y value	+/-xxxxx -30800 to +30800 "—— " if Cursor not used
246	1	Admittance status	0 = Y I = B 2 = G
247	1	Pressure Range status	0 = Normal 1 = Wide
248	1	Pressure Rate status	0 = 12.5 daPa/sec 1 = 50 daPa/sec 2 = 200 daPa/sec 3 = Not used
249	6	Peak Compliance data	+/-xxxxx -30800 to +30800
255	4	Peak Pressure data	+/-xxx -600 to +400 daPa
259	1	Sweep Direction status	0 = Positive to negative 1 = Negative to positive
260	3	Gradient data	"—"
263	2	Checksum	xx
265	1	Carriage return	"CR"
266	1	Line Feed	"LF"

NOTE

NOTE
Frequency in Hz = (Probe Tone value + 2) x 50

7.2 XY Graphical Data Record

7.2.1 Record Format

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	2 = XY Graphical data record
2	2	Record Sequence Number	xx 00 to 99
4	1	Test number	1 to 9 and A to Q
5	3	Number of XY data	xxx 0 to 29 pairs for Line 1
8	3	Number of XY data	xxx 0 to 29 pairs for Line 2
11	3	Number of XY data	xxx 0 to 29 pairs for Line 3
14	1	Data pair 1 X digit 4	Hex digit in ASCII format MSB
15	1	Data pair 1 X digit 3	Hex digit in ASCII format
16	1	Data pair 1 X digit 2	Hex digit in ASCII format
17	1	Data pair 1 X digit 1	Hex digit in ASCII format
18	1	Data pair 1 Y digit 4	Hex digit in ASCII format MSB
19	1	Data pair 1 Y digit 3	Hex digit in ASCII format
20	1	Data pair 1 Y digit 2	Hex digit in ASCII format
21	1	Data pair 1 Y digit 1	Hex digit in ASCII format
22	1	Data pair 2 X digit 4	Hex digit in ASCII format MSB
23	1	Data pair 2 X digit 3	Hex digit in ASCII format
24	1	Data pair 2 X digit 2	Hex digit in ASCII format
25	1	Data pair 2 X digit 1	Hex digit in ASCII format
26	1	Data pair 2 Y digit 4	Hex digit in ASCII format MSB
27	1	Data pair 2 Y digit 3	Hex digit in ASCII format
28	1	Data pair 2 Y digit 2	Hex digit in ASCII format
29	1	Data pair 2 Y digit 1	Hex digit in ASCII format
238	1	Data pair 29 X digit 4	Hex digit in ASCII format MSB
239	1	Data pair 29 X digit 3	Hex digit in ASCII format
240	1	Data pair 29 X digit 2	Hex digit in ASCII format
241	1	Data pair 29 X digit 1	Hex digit in ASCII format
242	1	Data pair 29 Y digit 4	Hex digit in ASCII format MSB
243	1	Data pair 29 Y digit 3	Hex digit in ASCII format
244	1	Data pair 29 Y digit 2	Hex digit in ASCII format
245	1	Data pair 29 Y digit 1	Hex digit in ASCII format
246	2	Checksum	xx
248	1	Carriage Return	"CR"
249	1	Line Feed	"LF"

7.2.2 X Value Description

Test	Data Type	Units	Range
Tymp Diagnostic	Pressure	daPa	-600 to +400
Tymp Screening	Pressure	daPa	-600 to +400
Reflex Threshold	Time	msec/2	0 to 30000
ETF - Intact TM	Pressure	daPa	-600 to +400
ETF - Perf TM	Time	msec/2	0 to 30000
Reflex Decay	Time	msec/2	0 to 30000
ARLT	Time	msec/2	0 to 1000
ARST	Time	msec/2	0 to 30000
Mult Hz screen #1	Pressure	daPa	-600 to +400
Mult Hz screen #2	Probe Hz	Hz	250 to 2000
Mult Hz screen #3	Pressure	daPa	-600 to +400

7.2.3 Y Value Description

Test	Data Type	Units	Range
Tymp Diagnostic	Compliance	ml/mmho x 1000	-30800 to +30800
Tymp Screening	Compliance	ml/mmho x 1000	-30800 to +30800
Reflex Threshold	Compliance	ml/mmho x 1000	-30800 to +30800
ETF - Intact TM	Compliance	ml/mmho x 1000	-30800 to +30800
ETF - Perf TM	Pressure	daPA	-600 to +400
Reflex Decay	Compliance	ml/mmho x 1000	-30800 to +30800
ARLT	Compliance	ml/mmho x 1000	-30800 to +30800
ARST	Compliance	ml/mmho x 1000	-30800 to +30800
Mult Hz Screen #1	Compliance	ml x 1000	-30800 to +30800
Mult Hz Screen #2			
Line 1	Compliance	ml/mmho x 1000	-30800 to +30800
Line 2	Phase	degrees	+5 to -180
Mult Hz Screen #3	Compliance	ml/mmho x 1000	-30800 to +30800

NOTE

The Y axis values for Tymp Diagnostic and ETF — Intact TM are transmitted as unbaselined values. If baseline is selected the baselined values may be obtained by subtracting the Y axis values from the Earcanal Volume.

7.2.4 Embedded Control Codes

7.2.4.1 Penup Code

Value = 7FFFH

Purpose = Embedded in the X and Y graphical data to indicate the end of the graph of a stimulus presentation during a Reflex type test. The code indicates to the plotting routines not to plot (draw) between the previous plotted point and the next point to produce the blank space between stimulus graphs on the LCD screen.

7.3 End of Summary and XY Data Record

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	3 = End of data record
2	2	Record Sequence Number	xx 00 to 99
4	2	Checksum	xx
6	1	Carriage Return	"CR"
7	1	Line Feed	"LF"

7.4 Error Record

Offset	# Char	Field Name	Field Definition
O	1	Start of record	"|"
1	1	Record Type	4 = Error record
2	2	Record Sequence Number	xx 00 to 99
4	3	Error Code	See Section 9
7	4	Error Sub Code	See Section 9
11	2	Checksum	xx
13	1	Carriage Return	"CR"
14	1	Line Feed	"LF"

7.5 Current X Axis and Y Axis Data Record - Normal Mode

Test	X Axis and Y Axis Quantity
Tymp Diagnostic	X = Pressure (daPa) Y = Compliance - Baseline (ml/mmho x 1000)
Tymp Screen-Tymp	X = Pressure (daPa) Y = Compliance - Baseline (ml x 1000)
Tymp Screen-Reflex	X = Time (msec) Y = Compliance - Reference compliance (ml/mmho x 1000)
Reflex Threshold	X = Time (msec) Y = Compliance - Reference compliance (ml/mmho x 1000)
ETF - Intact TM	X = Pressure (daPa) Y = Compliance - Baseline (ml/mmho x 1000)
ETF - Perforated TM	X = Pressure (daPa) Y = Time (msec)
Reflex Decay	X = Time (msec)Y = Compliance — Reference compliance (ml/mmho x 1000)
ARLT	X = Pressure (daPa)Y = Compliance — Reference compliance (ml/mmho x 1000)
ARST	X = Pressure (daPa) Y = Compliance - Reference compliance (ml/mmho x 1000)
Multiple Frequency Screen #1	X = Pressure (daPa) Y = Compliance (ml/mmho x 1000)
Multiple Frequency	Record not valid

Screen #2
Multiple Frequency — X = Pressure (daPa)
Screen #3 — Y = Compliance (ml/mmho x 1000)

NOTE
If Baseline is not selected the baseline value = 0. All Time values are referenced to the Y-axis (Time = 0)

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	5 = Current data record
2	2	Record Sequence Number	xx 00 to 99
4	1	X axis unit	0 = Time 1 = Pressure
5	5	X axis value	Time: xxxxx 0 to 60000 msec Pressure: +/-xxxxx -600 to +400 daPa
10	1	Y axis unit	0 = Compliance (Current selected Admittance. If B/G selected = B) 1 = Pressure
11	6	Y axis value	Compliance: +/-xxxxx -30800 to +30800 Pressure: +/-xxx -600 to +400 daPa
For	non-Reflex type tests:		
17	12	Zero Field	"_____ "
For	Reflex type tests:		
17	4	Pressure	Pressure: -600 to +400 daPa
21	8	Zero Field	"_____"
29	2	Checksum	xx
31	1	Carriage Return	"CR"
32	1	Line Feed	"LF"

7.6 Unit Identifier Record

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	6 = Unit identifier record
2	2	Record Sequence Number	xx 00 to 99
4	2	Unit type	0 = GSI TympStar Version 1 1 = GSI TympStar Version 2
6	4	Unit ID Number	xxxx "0000" = Default number

10	5	Software Revision #1	xx.xx	CP Revision #
15	5	Software Revision #2	xx.xx "00.00" =	SP Revision # Default revision
20	4	Zero field	"——"	
24	2	Checksum	xx	
26	1	Carriage Return	"CR"	
27	1	Line Feed	"LF"	

7.7 Mode Change Record

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Record Type	7 = Mode change record
2	2	Record Sequence Number	xx 00 to 99
4	1	New Mode	0 = Stop 1 = Hold 2 = Run 3 = Continue Softkey displayed 4 = Clear page(s) to continue 5 = Reflex type test stimulus presentation complete 6 = Self Calibration complete 7 = Default Cal data load complete 8 = Y/YBG calibration in current cavity complete
5	2	Checksum	xx
7	1	Carriage Return	"CR"
8	1	Line Feed	"LF"

7.8 Summary Data Record With Attached XY Data Records

See Section 1.0 Summary Data Records.

7.9 Input Record Query Results

7.9.1 Tymp Diagnostic Query Results

7.9.1.1 TYMP Diagnostic Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	003
7	1	Probe Tone	0 = 226 Hz
			1 = 678 Hz
			2 = 1000 Hz
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.1.2 TYMP Diagnostic Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	004
7	1	Admittance	0 = Y
			1 = B
			2 = G
			3 = B/G
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.1.3 TYMP Diagnostic Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	005
7	1	Pressure Range	0 = Normal
			1 = Wide
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.1.4 TYMP Diagnostic Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	006
7	1	Ear	0 = Left 1 = Right
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.1.5 TYMP Diagnostic Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	007
7	1	Pressure Rate	0 = 12.5 daPa/s 1 = 50 daPa/s 2 = 200 daPa/s 3 = 600/200 daPa/s
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.1.6 TYMP Diagnostic Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	008
7	1	Start Pressure	0 = -600 daPa 1 = -400 daPa 2 = -200 daPa 3 = +200 daPa 4 = +400 daPa 5 = -500 daPa 6 = -300 daPa 7 = 0 daPa 8 = +300 daPa
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.1.7 TYMP Diagnostic Baseline

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	009
7	1	Baseline	0 = ON 1 = OFF
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.1.8 TYMP Diagnostic Gradient

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	010
7	1	Gradient	0 = OFF 1 = TYMP WIDTH 2 = RATIO
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.1.9 TYMP Diagnostic Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	011
7	4	Tymp 1 X-value	XXXX -600 to 400
11	4	Tymp 1 Y-Value	XXXX
15	4	Tymp 2 X-value	XXXX -600 to 400
19	4	Tymp 2 Y-Value	XXXX
23	4	Tymp 3 X-value	XXXX -600 to 400
27	4	Tymp 3 Y-Value	XXXX
31	2	Checksum	XX
33	1	Carriage return	"CR"
34	1	Line feed	"LF"

7.9.2 Tymp Screening Individual SoftKey Commands

7.9.2.1 TYMP Screening Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	012
7	1	Pressure Range	0 = Normal 1 = Wide
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.2.2 TYMP Screening Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	013
7	1	Pressure Rate	0 = 200 daPa/s 1 = 600/200 daPa/s
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.2.3 TYMP Screening Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	014
7	1	Start Pressure	0 = -600 daPa 1 = -400 daPa 2 = -200 daPa 3 = +200 daPa 4 = +400 daPa
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.2.4 TYMP Screening Gradient

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	015
7	1	Gradient	0 = OFF 1 = TYMP WIDTH 2 = RATIO
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.2.5 TYMP Screening Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	016
7	1	Ear	0 = Left 1 = Right
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.2.6 TYMP Screening Baseline

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	017
7	1	Baseline	0 = ON 1 = OFF
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.2.7 TYMP Screening Auto Start

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	018
7	1	Auto Start	0 = ON 1 = OFF
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.2.8 TYMP Screening Reflex Type

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	019
7	1	Reflex Type	0 = OFF 1 = IPSI 2 = CONTRA 3 = IPSI/CONTRA
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.2.9 TYMP Screening Stimulus Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	020
7	1	500 Hz	0 = OFF 1 = ON
8	1	1000 Hz	0 = OFF 1 = ON
9	1	2000 Hz	0 = OFF 1 = ON
10	1	4000 Hz	0 = OFF 1 = ON
11	2	Checksum	XX
13	1	Carriage return	"CR"
14	1	Line feed	"LF"

7.9.2.10 TYMP Screening Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	021
7	4	Tymp 1 X-value	XXXX -600 to 400
11	4	Tymp 1 Y-Value	XXXX
15	2	Checksum	XX
17	1	Carriage return	"CR"
18	1	Line feed	"LF"

7.9.3 Reflex Threshold Individual SoftKey Commands

7.9.3.1 Reflex Threshold Stimulus Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	022
7	1	Reflex Type	0 = IPSI 1 = CONTRA STEADY 2 = CONTRA PULSED
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.3.2 Reflex Threshold Mark Threshold

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	023
7	1	Line 1 Marked Trace	X The number of the trace marked
8	1	Line 1 Mark Type	0 = "NR" 1 = "*" 2 = "NR" + "TS" 3 = "*" + "TS"
9	1	Line 2 Marked Trace	X The number of the trace marked
10	1	Line 2 Mark Type	0 = "NR" 1 = "*" 2 = "NR" + "TS" 3 = "*" + "TS"
11	2	Checksum	XX
13	1	Carriage return	"CR"
14	1	Line feed	"LF"

7.9.3.3 Reflex Threshold—Threshold Seek

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	024
7	1	Threshold Seek	0 = ON 1 = OFF
8	3	Min. Change	XXX
11	3	Start dBHL	XXX
14	3	Stop dBHL	XXX
17	2	Checksum	XX
19	1	Carriage return	"CR"
20	1	Line feed	"LF"

7.9.3.4 Reflex Threshold Auto Zero

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	025
7	1	Auto Zero	0 = Automatic 1 = Manual
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.3.5 Reflex Threshold Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	026
7	1	Ear	0 = Left 1 = Right
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.3.6 Reflex Threshold Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	027
7	1	Probe Tone	0 = 226 Hz 1 = 678 Hz 2 = 1000 Hz
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.3.7 Reflex Threshold Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	028
7	1	Admittance	0 = Y 1 = B 2 = G
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.3.8 Reflex Threshold Stimulus Timing

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	029
7	1	Auto Timing	0 = Manual Timing 1 = Auto Timing
8	5	ON time	XXXXX (msec)
13	5	OFF time	XXXXX (msec)
18	5	Quantity	XXXXX
23	2	Checksum	XX
25	1	Carriage return	"CR"
26	1	Line feed	"LF"

7.9.3.9 Reflex Threshold Timebase

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	030
7	1	Timebase	0 = 15 sec 1 = 30 sec 2 = 45 sec 3 = 60 sec
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.3.10 Reflex Threshold Step size

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	031
7	1	step size	0 = 1 dB 1 = 2 dB 2 = 5 dB
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.3.11 Reflex Threshold ml Scale

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	032
7	1	ml Scale	0 = +.04 to -.16 1 = +.08 to -.32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.16 6 = -.08 to +.32 7 = -.12 to +.48 8 = -.16 to +.64 9 = -.20 to +.80
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.3.12 Reflex Threshold Click Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	033
7	3	Click Rate	XXX (50 to 300 in multiples of 10)
10	2	Checksum	XX
12	1	Carriage return	"CR"
13	1	Line feed	"LF"

7.9.3.13 Reflex Threshold Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	034
7	4	Cursor X-value	XXXX
11	4	Cursor Line 1 Y-Value	XXXX
15	4	Cursor Line 2 Y-Value	XXXX
19	2	Checksum	XX
21	1	Carriage return	"CR"
22	1	Line feed	"LF"

7.9.3.14 Reflex Threshold Stimulus

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	035
7	2	Stimulus	00 = 250 Hz
			01 = 500 Hz
			02 = 1000 Hz
			03 = 2000 Hz
			04 = 4000 Hz
			05 = Low Band Noise
			06 = High Band Noise
			07 = Broad Band Noise
			08 = Click
			09 = External
			10 = Non Acoustic
9	2	Checksum	XX
11	1	Carriage return	"CR"
12	1	Line feed	"LF"

7.9.3.15 Reflex Threshold Intensity

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	036
7	3	Intensity	XXX dBHL
10	2	Checksum	XX
12	1	Carriage return	"CR"
13	1	Line feed	"LF"

7.9.4 ETF Intact Individual SoftKey Commands

7.9.4.1 ETF Intact Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	037
7	1	Probe Tone	0 = 226 Hz 1 = 678 Hz 2 = 1000 Hz
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.4.2 ETF Intact Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	038
7	1	Pressure Range	0 = Normal 1 = Wide
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.4.3 ETF Intact Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	039
7	1	Pressure Rate	0 = 12.5 daPa/s
			1 = 50 daPa/s
			2 = 200 daPa/s
			3 = 600/200 daPa/s
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.4.4 ETF Intact Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	040
7	1	Start Pressure	0 = -600 daPa
			1 = -400 daPa
			2 = -200 daPa
			3 = +200 daPa
			4 = +400 daPa
			5 = -500 daPa
			6 = -300 daPa
			7 = 0 daPa
			8 = +300 daPa
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.4.5 ETF Intact Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	041
7	1	Ear	0 = Left
			1 = Right
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.4.6 ETF Intact Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	042
7	1	Admittance	0 = Y
			1 = B
			2 = G
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.4.7 ETF Intact Baseline

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	043
7	1	Baseline	0 = ON
			1 = OFF
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.4.8 ETF Intact Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	044
7	4	Tymp 1 X-value	XXXX -600 to 400
11	4	Tymp 1 Y-Value	XXXX
15	4	Tymp 2 X-value	XXXX -600 to 400
19	4	Tymp 2 Y-Value	XXXX
23	4	Tymp 3 X-value	XXXX -600 to 400
27	4	Tymp 3 Y-Value	XXXX
31	2	Checksum	XX
33	1	Carriage return	"CR"
34	1	Line feed	"LF"

7.9.5 ETF Perforated TM Individual SoftKey Commands

7.9.5.1 ETF Perforated Pressure Max

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	046
7	4	Max Pressure	XXXX (-600 to +400 in multiples of 50)
11	2	Checksum	XX
13	1	Carriage return	"CR"
14	1	Line feed	"LF"

7.9.5.2 ETF Perforated Time (sec)

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	047
7	1	Time (sec)	0 = 30 sec 1 = 40 sec 2 = 50 sec 3 = 60 sec
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.5.3 ETF Perforated Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	048
7	4	Cursor X-value	XXXX
11	4	Cursor Y-Value	XXXX -600 to 400
15	2	Checksum	XX
17	1	Carriage return	"CR"
18	1	Line feed	"LF"

7.9.5.4 ETF Perforated Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	048
7	1	Ear	0 = Left 1 = Right
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.6 Reflex Decay Individual SoftKey Commands

7.9.6.1 Reflex Decay Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	050
7	1	Probe Tone	0 = 226 Hz 1 = 678 Hz
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.6.2 Reflex Decay Stimulus Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	051
7	1	Reflex Type	0 = IPSI 1 = CONTRA
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.6.3 Reflex Decay Stimulus On-Time

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	052
7	5	Parameter value	XXXXX
12	2	Checksum	XX
14	1	Carriage return	"CR"
15	1	Line feed	"LF"

7.9.6.4 Reflex Decay Auto Zero

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	053
7	1	Auto Zero	0 = Automatic 1 = Manual
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.6.5 Reflex Decay Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	054
7	1	Ear	0 = Left 1 = Right
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.6.6 Reflex Decay Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	055
7	1	Admittance	0 = Y
			1 = B
			2 = G
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.6.7 Reflex Decay Timebase

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	056
7	1	Timebase	0 = 15 sec
			1 = 30 sec
			2 = 45 sec
			3 = 60 sec
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.6.8 Reflex Decay Step size

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	057
7	1	step size	0 = 1 dB
			1 = 2 dB
			2 = 5 dB
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.6.9 Reflex Decay ml Scale

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	058
7	1	ml Scale	0 = +.04 to -.16
			1 = +.08 to -.32
			2 = +.12 to -.48
			3 = +.16 to -.64
			4 = +.20 to -.80
			5 = -.04 to +.16
			6 = -.08 to +.32
			7 = -.12 to +.48
			8 = -.16 to +.64
			9 = -.20 to +.80
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.6.10 Reflex Decay Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	059
7	4	Cursor X-value	XXXX
11	4	Cursor Line 1 Y-Value	XXXX
15	4	Cursor Line 2 Y-Value	XXXX
19	2	Checksum	XX
21	1	Carriage return	"CR"
22	1	Line feed	"LF"

7.9.6.11 Reflex Decay Stimulus

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	060
7	2	Stimulus	00 = 250 Hz
			01 = 500 Hz
			02 = 1000 Hz
			03 = 2000 Hz
			04 = 4000 Hz
			05 = Low Band Noise

			06 = High Band Noise 07 = Broad Band Noise 08 = Click 09 = External
9	2	Checksum	XX
11	1	Carriage return	"CR"
12	1	Line feed	"LF"

7.9.6.12 Reflex Decay Intensity

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	061
7	3	Intensity	XXX dBHL
10	2	Checksum	XX
12	1	Carriage return	"CR"
13	1	Line feed	"LF"

7.9.7 ARLT Individual SoftKey Commands

7.9.7.1 ARLT Stimulus Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	062
7	1	Reflex Type	0 = IPSI 1 = CONTRA
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.7.2 ARLT Stimulus On-Time

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	063
7	5	Reflex Type	XXXX
12	2	Checksum	XX
14	1	Carriage return	"CR"
15	1	Line feed	"LF"

7.9.7.3 ARLT Auto Zero

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	064
7	1	Auto Zero	0 = Automatic 1 = Manual
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.7.4 ARLT ml Scale

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	065
7	1	ml Scale	0 = +.04 to -.16 1 = +.08 to -.32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.16 6 = -.08 to +.32 7 = -.12 to +.48 8 = -.16 to +.64 9 = -.20 to +.80
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.7.5 ARLT Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	066
7	1	Ear	0 = Left 1 = Right
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.7.6 ARLT Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	067
7	1	Admittance	0 = Y
			1 = B
			2 = G
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.7.7 ARLT Timebase

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	068
7	1	Timebase	0 = 500 msec
			1 = 1000 msec
			2 = 1500 msec
			3 = 2000 msec
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.7.8 ARLT Step size

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	069
7	1	step size	0 = 1 dB
			1 = 2 dB
			2 = 5 dB
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.7.9 ARLT Average

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	070
7	2	Average	XX (2-50)
9	2	Checksum	XX
11	1	Carriage return	"CR"
13	1	Line feed	"LF"

7.9.7.10 ARLT Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	071
7	4	Cursor X-value	XXXX
11	4	Cursor Line 1 Y-Value	XXXX
15	4	Cursor Line 2 Y-Value	XXXX
19	2	Checksum	XX
21	1	Carriage return	"CR"
22	1	Line feed	"LF"

7.9.7.11ARLT Stimulus

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	072
7	2	Stimulus	00 = Unused 01 = 500 Hz 02 = 1000 Hz 03 = 2000 Hz 04 = 4000 Hz 05 = Low Band Noise 06 = High Band Noise 07 = Broad Band Noise 08 = Click 09 = External
9	2	Checksum	XX
11	1	Carriage return	"CR"
12	1	Line feed	"LF"

7.9.7.12 ARLT Intensity

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	073
7	3	Intensity	XXX dBHL
10	2	Checksum	XX
12	1	Carriage return	"CR"
13	1	Line feed	"LF"

7.9.8 A.R. Sensitization Individual SoftKey Commands

7.9.8.1 A.R. Sensitization Stimulus Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	074
7	1	Reflex Type	0 = IPSI 1 = CONTRA 2 = Cfla 3 = CfCa 4 = IfCa 5 = Ifla
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.8.2 A.R. Sensitization Stimulus Timing

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	075
7	1	Auto Timing	0 = Manual Timing 1 = Auto Timing
8	5	ON time	XXXXX
13	5	OFF time	XXXXX
18	5	Quantity	XXXXX
23	2	Checksum	XX
25	1	Carriage return	"CR"
26	1	Line feed	"LF"

7.9.8.3 A.R. Sensitization Auto Zero

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	076
7	1	Auto Zero	0 = Automatic 1 = Manual
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.8.4 A.R. Sensitization ml Scale

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	077
7	1	ml Scale	0 = +.04 to -.16 1 = +.08 to -.32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.16 6 = -.08 to +.32 7 = -.12 to +.48 8 = -.16 to +.64 9 = -.20 to +.80
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.8.5 A.R. Sensitization Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	078
7	1	Ear	0 = Left 1 = Right
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.8.6 A.R. Sensitization Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	079
7	1	Admittance	0 = Y
			1 = B
			2 = G
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.8.7 A.R. Sensitization Timebase

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	080
7	1	Timebase	0 = 1.5 sec
			1 = 3.0 sec
			2 = 4.5 sec
			3 = 6.0 sec
			4 = 7.5 sec
			5 = 9.0 sec
			6 = 10.5 sec
			7 = 12.0 sec
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.8.8 A.R. Sensitization Step size

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	081
7	1	step size	0 = 1 dB
			1 = 2 dB
			2 = 5 dB
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.8.9 A.R. Sensitization Facilitator

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	082
7	2	Stimulus	00 = 500 Hz 01 = 1000 Hz 02 = 2000 Hz 03 = 4000 Hz 04 = Broad Band Noise 05 = External 06 = 6000 Hz 07 = Non-Acoustic
9	3	Intensity	XXX dBHL
12	2	Checksum	XX
14	1	Carriage return	"CR"
15	1	Line feed	"LF"

7.9.8.10 A.R. Sensitization Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	083
7	4	Cursor X-value	XXXX
11	4	Cursor Line 1 Y-Value	XXXX
15	4	Cursor Line 2 Y-Value	XXXX
19	2	Checksum	XX
21	1	Carriage return	"CR"
22	1	Line feed	"LF"

7.9.8.11A.R. Sensitization Stimulus

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	084
7	2	Stimulus	00 = 500 Hz 01 = 1000 Hz 02 = 2000 Hz 03 = 4000 Hz 04 = Broad Band Noise 05 = External 06 = Non Acoustic 07 = 6000 Hz

9	2	Checksum	XX
11	1	Carriage return	"CR"
12	1	Line feed	"LF"

7.9.8.12 A.R. Sensitization Intensity

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	085
7	3	Intensity	XXX dBHL
10	2	Checksum	XX
12	1	Carriage return	"CR"
13	1	Line feed	"LF"

7.9.9 Multiple Hz #1 Individual SoftKey Commands

7.9.9.1 Multiple Hz #1 Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	086
7	1	Pressure Range	0 = Normal 1 = Wide
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.9.2 Multiple Hz #1 Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	087
7	1	Pressure Rate	0 = 12.5 daPa/s 1 = 50 daPa/s 2 = 200 daPa/s
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.9.3 Multiple Hz #1 Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	088
7	1	Start Pressure	0 = -600 daPa
			1 = -400 daPa
			2 = -200 daPa
			3 = +200 daPa
			4 = +400 daPa
			5 = -500 daPa
			6 = -300 daPa
			7 = 0 daPa
			8 = +300 daPa
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.9.4 Multiple Hz #1 Delta Plot

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	089
7	1	Admittance	0 = Y
			1 = B
			2 = G
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.9.5 Multiple Hz #1 Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	090
7	1	Ear	0 = Left
			1 = Right
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.9.6 Multiple Hz #1 Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	091
7	4	Cursor X-value	XXXX
11	4	Cursor Y-Value	XXXX
15	2	Checksum	XX
17	1	Carriage return	"CR"
18	1	Line feed	"LF"

7.9.10 Multiple Hz #2 Individual SoftKey Commands

7.9.10.1 Multiple Hz #2 Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	093
7	4	Cursor X-value	XXXX
11	4	Cursor Y-Value	XXXX
15	2	Checksum	XX
17	1	Carriage return	"CR"
18	1	Line feed	"LF"

7.9.11 Multiple Hz #3 Individual SoftKey Commands

7.9.11.1 Multiple Hz #3 Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	095
7	4	Probe Hz	XXXX (250 - 2000 Hz in multiples of 50)
11	2	Checksum	XX
13	1	Carriage return	"CR"
14	1	Line feed	"LF"

7.9.11.2Multiple Hz #3 Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	096
7	4	Cursor X-value	XXXX
11	4	Cursor Y-Value	XXXX
15	4	Cursor Y-Value	XXXX Extra cursor value if B/G Admittance otherwise '——'
19	2	Checksum	XX
21	1	Carriage return	"CR"
22	1	Line feed	"LF"

7.9.11.3Multiple Hz #3 Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	098
7	1	Admittance	0 = Y 1 = B 2 = G 3 = BG
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.11.4Multiple Hz #3 Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	099
7	1	Pressure Range	0 = Normal 1 = Wide
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.11.5 Multiple Hz #3 Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	100
7	1	Pressure Rate	0 = 12.5 daPa/s 1 = 50 daPa/s 2 = 200 daPa/s
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.11.6 Multiple Hz #3 Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	101
7	1	Start Pressure	0 = -600 daPa 1 = -400 daPa 2 = -200 daPa 3 = +200 daPa 4 = +400 daPa 5 = -500 daPa 6 = -300 daPa 7 = 0 daPa 8 = +300 daPa
8	2	Checksum	XX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

7.9.12 Keyboard Entry Records

7.9.12.1 Patient Name

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	102
7	45	Patient Name	45 ASCII characters
52	2	Checksum	XX
54	1	Carriage return	"CR"
55	1	Line feed	"LF"

7.9.12.2 Patient ID

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	103
7	45	Patient ID	45 ASCII characters
52	2	Checksum	XX
54	1	Carriage return	"CR"
55	1	Line feed	"LF"

7.9.12.3 Tester Name

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	104
7	45	Tester Name	45 ASCII characters
52	2	Checksum	XX
54	1	Carriage return	"CR"
55	1	Line feed	"LF"

7.9.12.4 Facility Name

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	105
7	45	Facility Name	45 ASCII characters
52	2	Checksum	XX
54	1	Carriage return	"CR"
55	1	Line feed	"LF"

7.9.13 Instrument Options

7.9.13.1 Print Format Command

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	108
7	1	Tymp Diagnostic	0 = Graphics 1 = Tabular
8	1	Reflex Threshold	0 = Graphics 1 = Tabular
9	1	Reflex Decay	0 = Graphics 1 = Tabular
10	1	ETF Intact	0 = Graphics 1 = Tabular
11	1	ETF Perforated	0 = Graphics 1 = Tabular
12	1	ARLT	0 = Graphics 1 = Tabular
13	1	A.R. Sensi.	0 = Graphics 1 = Tabular
14	1	Multiple Hz	0 = Graphics 1 = Tabular
15	2	Checksum	XX
17	1	Carriage return	"CR"
18	1	Line feed	"LF"

7.9.13.2 Set External Printer Settings

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	109
4	1	Left Column Setting	0 = Left Ear 1 = Right Ear
5	1	Print Type	0 = Color 1 = Black & White
6	2	Checksum	XX
8	1	Carriage return	"CR"
9	1	Line feed	"LF"

7.9.13.3 Data Transfer Settings

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	110
7	1	Tymp Diagnostic	0 = Summary Data 1 = Summary + Graphics
8	1	Reflex Threshold	0 = Summary Data 1 = Summary + Graphics
9	1	Reflex Decay	0 = Summary Data 1 = Summary + Graphics
10	1	ETF Intact	0 = Summary Data 1 = Summary + Graphics
11	1	ETF Perforated	0 = Summary Data 1 = Summary + Graphics
12	1	ARLT	0 = Summary Data 1 = Summary + Graphics
13	1	A.R. Sensi.	0 = Summary Data 1 = Summary + Graphics
14	1	Multiple Hz	0 = Summary Data 1 = Summary + Graphics
15	1	Clear Test	0 = Manual 1 = Auto
16	2	Checksum	XX
18	1	Carriage return	"CR"
19	1	Line feed	"LF"

7.9.13.4 Language

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	111
7	1	LCD & Printer Language	0 = English 1 = French 2 = German 3 = Spanish 4 = Italian
8	1	Keyboard Language	0 = English 1 = French 2 = German 3 = Spanish 4 = Italian
9	2	Checksum	XX
11	1	Carriage return	"CR"
12	1	Line feed	"LF"

7.9.13.5 Test Sequence Setting

7.9.13.5.1 Set Test Sequence Setting Reflex Threshold

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	112
7	1	Reflex Threshold Switch	0 = ON 1 = OFF
8	1	500 Hz	0 = YES 1 = NO
9	1	1000 Hz	0 = YES 1 = NO
10	1	2000 Hz	0 = YES 1 = NO
11	1	4000 Hz	0 = YES 1 = NO
12	1	LB Noise	0 = YES 1 = NO
13	1	HB Noise	0 = YES 1 = NO
14	1	BB Noise	0 = YES 1 = NO
15	1	Stimulus Ear	0 = IPSI 1 = CONTRA 2 = IPSI/CONTRA
16	2	Checksum	XX
18	1	Carriage return	"CR"
19	1	Line feed	"LF"

7.9.13.5.2 Set Test Sequence Setting Reflex Decay

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	113
7	1	Reflex Decay Switch	0 = ON 1 = OFF
8	1	500 Hz	0 = YES 1 = NO
9	1	1000 Hz	0 = YES 1 = NO
10	1	2000 Hz	0 = YES 1 = NO
11	1	4000 Hz	0 = YES 1 = NO

12	1	IPSI	0 = YES 1 = NO
13	1	CONTRA	0 = YES 1 = NO
14	2	Checksum	XX
16	1	Carriage return	"CR"
17	1	Line feed	"LF"

7.9.13.6 Remote Settings

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	114
7	1	Baud Rate	0 = 300 1 = 600 2 = 1200 3 = 2400 4 = 4800 5 = 9600 6 = 19,200
8	1	Parity	0 = NONE 1 = ODD 2 = EVEN
9	1	Stop Bits	0 = 1 Bit 1 = 2 Bits
10	1	RTS/CTS	0 = ON 1 = OFF
11	1	Data Format	0 = GSI TYMPSTAR 1 = GSI 33
12	2	Checksum	XX
14	1	Carriage return	"CR"
15	1	Line feed	"LF"

7.9.13.7 Date/Time Formats

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	115
7	1	Date Format	0 = MM/DD/YYYY 1 = DD/MM/ YYYY 2 = YYYY/MM/DD
8	1	Time Format	0 = 12 Hour 1 = 24 Hour
9	2	Checksum	XX

11	1	Carriage return	"CR"
12	1	Line feed	"LF"

7.9.13.8 Date Command

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	116
7	2	Month	XX
9	2	Day	XX
11	4	Year	XXXX
15	2	Checksum	XX
17	1	Carriage return	"CR"
18	1	Line feed	"LF"

7.9.13.9 Time Command

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	1	Request Record	9 = Query Record
2	2	Record Sequence #	XX 00 to 99
4	3	Record type	117
7	2	Hour	XX
9	2	Minute	XX
11	2	Checksum	XX
13	1	Carriage return	"CR"
14	1	Line feed	"LF"

8 Input Record Formats

8.1 Single Key Commands

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	001
4	1	Request code	0 = Send 1 = Not used
5	2	Function keycode	Function Keycodes 00-26 00 = Softkey 1 01 = Softkey 2 02 = Softkey 3 03 = Softkey 4 04 = Softkey 5 05 = Softkey 6 06 = TYMP 07 = REFLEX 08 = ETF 09 = SPECIAL 10 = START_R 11 = START_L 12 = ERASE 13 = RETURN 14 = PAGE 15 = CLEAR 16 = REMOTE 17 = DATA_X 18 = STIM_D 19 = STIM_U 20 = INTEN_D 21 = INTEN_U 22 = PRINT 23 = UNUSED 24 = STOP 25 = HOLD 26 = PRESENT
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.2 Tymp Diagnostic Individual SoftKey Commands

8.2.1 Start Auto Sequence Command

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	002
4	1	Request code	0 = Send 1 = Not used
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.2.2 Set TYMP Diagnostic Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	003
4	1	Request code	0 = Send 1 = Query for Probe Hz value
5	1	Probe Tone	0 = 226 Hz 1 = 678 Hz 2 = 1000 Hz
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.2.3 Set TYMP Diagnostic Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	004
4	1	Request code	0 = Send 1 = Query for Admittance value
5	1	Admittance	0 = Y 1 = B 2 = G 3 = B/G
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.2.4 Set TYMP Diagnostic Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	005
4	1	Request code	0 = Send 1 = Query for Pressure Range selection
5	1	Pressure Range	0 = Normal 1 = Wide
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.2.5 TYMP Diagnostic Ear Toggle

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	006
4	1	Selection code	0 = Send 1 = Query for ear selection
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.2.6 Set TYMP Diagnostic Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	007
4	1	Request code	0 = Send 1 = Query for Pressure Rate selection
5	1	Pressure Rate	0 = 12.5 daPa/s 1 = 50 daPa/s 2 = 200 daPa/s 3 = 600/200 daPa/s

6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.2.7 Set TYMP Diagnostic Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	008
4	1	Request code	0 = Send 1 = Query for Start Pressure selection
5	1	Start Pressure	0 = -600 daPa 1 = -400 daPa 2 = -200 daPa 3 = +200 daPa 4 = +400 daPa 5 = -500 daPa 6 = -300 daPa 7 = 0 daPa 8 = +300 daPa
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.2.8 Set TYMP Diagnostic Baseline

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	009
4	1	Request code	0 = Send 1 = Query for Baseline selection
5	1	Baseline	0 = ON 1 = OFF
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.2.9 Set TYMP Diagnostic Gradient

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	010
4	1	Request code	0 = Send 1 = Query for Gradient selection
5	1	Gradient	0 = TYMP WIDTH 1 = RATIO 2 = OFF
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.2.10 Set TYMP Diagnostic Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	011
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right 2 = Set Tymp 1 Peak 3 = Set Tymp 2 Peak 4 = Set Tymp 3 Peak
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.3 Tymp Screening Individual SoftKey Commands

8.3.1 Set TYMP Screening Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	012
4	1	Request code	0 = Send 1 = Query for Pressure Range selection
5	1	Pressure Range	0 = Normal 1 = Wide
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.3.2 Set TYMP Screening Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	013
4	1	Request code	0 = Send 1 = Query for Pressure Rate selection
5	1	Pressure Rate	0 = 200 daPa/s 1 = 600/200 daPa/s
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.3.3 Set TYMP Screening Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	014
4	1	Request code	0 = Send 1 = Query for Start Pressure selection
5	1	Start Pressure	0 = -600 daPa 1 = -400 daPa 2 = -200 daPa 3 = +200 daPa 4 = +400 daPa
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.3.4 Set TYMP Screening Gradient

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	015
4	1	Request code	0 = Send 1 = Query for Gradient selection
5	1	Gradient	0 = TYMP WIDTH 1 = RATIO 2 = OFF
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.3.5 TYMP Screening Ear Toggle

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	016
4	1	Selection code	0 = Send 1 = Query for ear selection
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.3.6 Set TYMP Screening Baseline

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	017
4	1	Request code	0 = Send 1 = Query for Baseline selection
5	1	Baseline	0 = ON 1 = OFF
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.3.7 Set TYMP Screening Auto Start

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	018
4	1	Request code	0 = Send 1 = Query for Auto Start selection
5	1	Auto Start	0 = ON 1 = OFF
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.3.8 Set TYMP Screening Reflex Type

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	019
4	1	Request code	0 = Send 1 = Query for Reflex Type selection
5	1	Reflex Type	0 = OFF 1 = IPSI 2 = CONTRA 3 = IPSI/CONTRA
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.3.9 Set TYMP Screening Stimulus Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	020
4	1	Request code	0 = Send 1 = Query for Stimulus Hz selection(s)
5	1	500 Hz	0 = ON 1 = OFF
6	1	1000 Hz	0 = ON 1 = OFF
7	1	2000 Hz	0 = ON 1 = OFF
8	1	4000 Hz	0 = ON 1 = OFF
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.3.10 Set TYMP Screening Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	021
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right 2 = Set Tymp 1 Peak
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.4 Reflex Threshold Individual SoftKey Commands

8.4.1 Set Reflex Threshold Stimulus Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	022
4	1	Request code	0 = Send 1 = Query for Stimulus Ear selection
5	1	Reflex Type	0 = IPSI 1 = CONTRA STEADY 2 = CONTRA PULSED
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.4.2 Set Reflex Threshold Mark Threshold

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	023
4	1	Request code	0 = Send 1 = Query for Mark Threshold selection
5	1	Mark Line Selection	0 = Move Right 1 = INVALID 2 = Mark Line 1 3 = Mark Line 2 4 = NR Line 1 5 = NR Line 2
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.4.3 Set Reflex Threshold—Threshold Seek

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	024
4	1	Request code	0 = Send 1 = Query for Threshold Seek selection
5	1	Threshold Seek	0 = ON 1 = OFF 2 = Configure
6	1	Parameter Type	0 = Min. Change 1 = Start dBHL 2 = Stop dBHL
7	3	Parameter Value	XXX (Min. Changes 2 to 80 representing 0.02 to 0.80) (Start dBHL XXX 035 dBHL to 110 dBHL) (Stop dBHL XXX 035 dBHL to 110 dBHL)

NOTE
Start dBHL cannot be larger than Stop dBHL and Stop dBHL cannot be smaller than Start dBHL.

10	1	Carriage return	"CR"
11	1	Line feed	"LF"

8.4.4 Set Reflex Threshold Auto Zero

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	025
4	1	Request code	0 = Send 1 = Query for Auto Zero selection
5	1	Auto Zero	0 = Automatic 1 = Manual
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.4.5 Reflex Threshold Ear Toggle

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	026
4	1	Selection code	0 = Send 1 = Query for ear selection
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.4.6 Set Reflex Threshold Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	027
4	1	Request code	0 = Send 1 = Query for Probe Hz value
5	1	Probe Tone	0 = 226 Hz 1 = 678 Hz 2 = 1000 Hz
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.4.7 Set Reflex Threshold Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	028
4	1	Request code	0 = Send 1 = Query for Admittance value
5	1	Admittance	0 = Y 1 = B 2 = G
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.4.8 Set Reflex Threshold Stimulus Timing

Offset	# Char	Field Name	Field Definition	
0	1	Start of record	"|"	
1	3	Record type	029	
4	1	Request code	0 = Send 1 = Query for Stimulus timing selection	
5	1	Auto Timing	0 = Manual Timing 1 = Auto Timing	
6	1	Parameter type	0 = ON time 1 = OFF time 2 = Quantity	**See chart of valid selections below**
7	5	Parameter value	XXXXX	
12	1	Carriage return	"CR"	
13	1	Line feed	"LF"	

Timebase	On Time			Off Time			Quantity		
	Min	Max	Incr	Min	Max	Incr	Min	Max	Incr
15000	1000	13500	500	0	12500	500	1	10	1
30000	1000	27000	500	0	26000	500	1	10	1
45000	2000	40000	2000	0	38000	2000	1	10	1
60000	2000	54000	2000	0	52000	2000	1	10	1

NOTE
The sum of the On-time and Off-Time cannot be greater than 90% of the timebase and the ON-time cannot be 0.

8.4.9 Set Reflex Threshold Timebase

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	030
4	1	Request code	0 = Send 1 = Query for Timebase selection
5	1	Timebase	0 = 15 sec 1 = 30 sec 2 = 45 sec 3 = 60 sec
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.4.10 Set Reflex Threshold Step size

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	031
4	1	Request code	0 = Send 1 = Query for Step Size selection
5	1	step size	0 = 1 dB 1 = 2 dB 2 = 5 dB
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.4.11 Set Reflex Threshold ml Scale

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	032
4	1	Request code	0 = Send 1 = Query for ml Scale selection
5	1	ml Scale	0 = +.04 to -.16 1 = +.08 to -.32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.16 6 = -.08 to +.32 7 = -.12 to +.48 8 = -.16 to +.64 9 = -.20 to +.80
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.4.12 Set Reflex Threshold Click Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	033
4	1	Request code	0 = Send 1 = Query for Timebase selection
5	3	Click Rate	XXX (50 to 300 in multiples of 10)
8	1	Carriage return	"CR"
9	1	Line feed	"LF"

8.4.13 Set Reflex Threshold Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	034
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.4.14 Set Reflex Threshold Stimulus

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	035
4	1	Request code	0 = Send 1 = Query for Stimulus selection
5	2	Stimulus	00 = 250 Hz 01 = 500 Hz 02 = 1000 Hz 03 = 2000 Hz 04 = 4000 Hz 05 = Low Band Noise 06 = High Band Noise 07 = Broad Band Noise 08 = Click 09 = External 10 = Non Acoustic
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.4.15 Set Reflex Threshold Intensity

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	036
4	1	Request code	0 = Send 1 = Query for Intensity selection
5	3	Intensity	XXX dBHL (035 – XXX depending of Stimulus)
8	1	Carriage return	"CR"
9	1	Line feed	"LF"

8.5 ETF Intact Individual Softkey Commands

8.5.1 Set ETF Intact Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	037
4	1	Request code	0 = Send 1 = Query for Probe Hz value
5	1	Probe Tone	0 = 226 Hz 1 = 678 Hz 2 = 1000 Hz
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.5.2 Set ETF Intact Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	038
4	1	Request code	0 = Send 1 = Query for Pressure Range selection
5	1	Pressure Range	0 = Normal 1 = Wide
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.5.3 Set ETF Intact Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	039
4	1	Request code	0 = Send 1 = Query for Pressure Rate selection
5	1	Pressure Rate	0 = 12.5 daPa/s 1 = 50 daPa/s 2 = 200 daPa/s 3 = 600/200 daPa/s
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.5.4 Set ETF Intact Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	040
4	1	Request code	0 = Send 1 = Query for Start Pressure selection
5	1	Start Pressure	0 = -600 daPa 1 = -400 daPa 2 = -200 daPa 3 = +200 daPa 4 = +400 daPa 5 = -500 daPa 6 = -300 daPa 7 = 0 daPa 8 = +300 daPa
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.5.5 ETF Intact Ear Toggle

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	041
4	1	Selection code	0 = Send 1 = Query for ear selection
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.5.6 Set ETF Intact Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	042
4	1	Request code	0 = Send 1 = Query for Admittance value
5	1	Admittance	0 = Y 1 = B 2 = G
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.5.7 Set ETF Intact Baseline

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	043
4	1	Request code	0 = Send 1 = Query for Baseline selection
5	1	Baseline	0 = ON 1 = OFF
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.5.8 Set ETF Intact Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	044
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right 2 = Set Tymp 1 Peak 3 = Set Tymp 2 Peak 4 = Set Tymp 3 Peak
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.5.9 Set ETF Intact Continue

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	045
4	1	Request code	0 = Send
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.6 ETF Perforated TM Individual Softkey Commands

8.6.1 Set ETF Perforated Pressure Max

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	046
4	1	Request code	0 = Send 1 = query for maximum pressure
5	4	Max Pressure	XXXX (-600 to +400 in multiples of 50)
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.6.2 Set ETF Perforated Time (sec)

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	047
4	1	Request code	0 = Send 1 = query for ETF Perf. time
5	1	Time (sec)	0 = 30 sec 1 = 40 sec 2 = 50 sec 3 = 60 sec
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.6.3 Set ETF Perforated Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	048
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.6.4 ETF Perforated Ear Toggle

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	049
4	1	Selection code	0 = Send 1 = Query for ear selection
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.7 Reflex Decay Individual Softkey Commands

8.7.1 Set Reflex Decay Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	050
4	1	Request code	0 = Send 1 = Query for Probe Hz value
5	1	Probe Tone	0 = 226 Hz 1 = 678 Hz
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.7.2 Set Reflex Decay Stimulus Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	051
4	1	Request code	0 = Send 1 = Query for Stimulus Ear selection
5	1	Reflex Type	0 = IPSI 1 = CONTRA
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.7.3 Set Reflex Decay Stimulus On-Time

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	052
4	1	Request code	0 = Send 1 = Query for Stimulus On-Time selection
5	5	Parameter value	XXXXX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

Timebase	On Time		
	Min	Max	Incr
15000	1000	13000	1000
30000	1000	27000	1000
45000	2000	40000	2000
60000	2000	54000	2000

8.7.4 Set Reflex Decay Auto Zero

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	053
4	1	Request code	0 = Send 1 = Query for Auto Zero selection
5	1	Auto Zero	0 = Automatic 1 = Manual
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.7.5 Reflex Decay Ear Toggle

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	054
4	1	Selection code	0 = Send 1 = Query for ear selection
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.7.6 Set Reflex Decay Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	055
4	1	Request code	0 = Send 1 = Query for Admittance value
5	1	Admittance	0 = Y 1 = B 2 = G
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.7.7 Set Reflex Decay Timebase

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	056
4	1	Request code	0 = Send 1 = Query for Timebase selection
5	1	Timebase	0 = 15 sec 1 = 30 sec

			2 = 45 sec
			3 = 60 sec
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.7.8 Set Reflex Decay Step size

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	057
4	1	Request code	0 = Send
			1 = Query for Step size selection
5	1	step size	0 = 1 dB
			1 = 2 dB
			2 = 5 dB
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.7.9 Set Reflex Decay ml Scale

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	058
4	1	Request code	0 = Send
			1 = Query for ml Scale selection
5	1	ml Scale	0 = +.04 to -.16
			1 = +.08 to -.32
			2 = +.12 to -.48
			3 = +.16 to -.64
			4 = +.20 to -.80
			5 = -.04 to +.16
			6 = -.08 to +.32
			7 = -.12 to +.48
			8 = -.16 to +.64
			9 = -.20 to +.80
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.7.10 Set Reflex Decay Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	059
4	1	Request code	0 = Send
			1 = get cursor value

5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.7.11 Set Reflex Decay Stimulus

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	060
4	1	Request code	0 = Send 1 = Query for Stimulus selection
5	2	Stimulus	00 = 250 Hz 01 = 500 Hz 02 = 1000 Hz 03 = 2000 Hz 04 = 4000 Hz 05 = Low Band Noise 06 = High Band Noise 07 = Broad Band Noise 08 = Click 09 = External
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.7.12 Set Reflex Decay Intensity

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	061
4	1	Request code	0 = Send 1 = Query for Intensity selection
5	3	Intensity	XXX dBHL (035 – XXX depending of Stimulus)
8	1	Carriage return	"CR"
9	1	Line feed	"LF"

8.8 ARLT Individual Softkey Commands

8.8.1 Set ARLT Stimulus Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	062
4	1	Request code	0 = Send 1 = Query for Stimulus Ear selection
5	1	Reflex Type	0 = IPSI 1 = CONTRA
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.8.2 Set ARLT Stimulus On-Time

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	063
4	1	Request code	0 = Send 1 = Query for Stimulus On-Time selection
5	5	Reflex Type	XXXX (see chart below for valid values)
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

Timebase	On Time		
	Min	Max	Incr
500	100	450	50
1000	100	900	50
1500	150	1350	150
2000	150	1800	150

8.8.3 Set ARLT Auto Zero

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	064
4	1	Request code	0 = Send 1 = Query for Auto Zero selection
5	1	Auto Zero	0 = Automatic 1 = Manual
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.8.4 Set ARLT ml Scale

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	065
4	1	Request code	0 = Send 1 = Query for ml Scale selection
5	1	ml Scale	0 = +.04 to -.16 1 = +.08 to -.32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.16 6 = -.08 to +.32 7 = -.12 to +.48 8 = -.16 to +.64 9 = -.20 to +.80
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.8.5 ARLT Ear Toggle

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	066
4	1	Selection code	0 = Send 1 = Query for ear selection
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.8.6 Set ARLT Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	067
4	1	Request code	0 = Send 1 = Query for Admittance value
5	1	Admittance	0 = Y 1 = B 2 = G
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.8.7 Set ARLT Timebase

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	068
4	1	Request code	0 = Send 1 = Query for Timebase selection
5	1	Timebase	0 = 500 msec 1 = 1000 msec 2 = 1500 msec 3 = 2000 msec
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.8.8 Set ARLT Step size

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	069
4	1	Request code	0 = Send 1 = Query for Step size selection
5	1	step size	0 = 1 dB 1 = 2 dB 2 = 5 dB
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.8.9 Set ARLT Average

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	070
4	1	Request code	0 = Send 1 = Query for Timebase selection
5	2	Average	XX (2-50)
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.8.10 Set ARLT Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	071
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.8.11 Set ARLT Stimulus

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	072
4	1	Request code	0 = Send 1 = Query for Stimulus selection
5	2	Stimulus	00 = Unused 01 = 500 Hz 02 = 1000 Hz 03 = 2000 Hz 04 = 4000 Hz 05 = Low Band Noise 06 = High Band Noise 07 = Broad Band Noise 08 = Click 09 = External
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.8.12 Set ARLT Intensity

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	073
4	1	Request code	0 = Send 1 = Query for Intensity selection
5	3	Intensity	XXX dBHL (035 – XXX depending of Stimulus)
8	1	Carriage return	"CR"

8.9 A.R. Sensitization Individual Softkey Commands

8.9.1 Set A.R. Sensitization Stimulus Ear

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	074
4	1	Request code	0 = Send 1 = Query for Stimulus Ear selection
5	1	Reflex Type	0 = IPSI 1 = CONTRA 2 = Cfla 3 = CfCa 4 = IfCa 5 = Ifla
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.9.2 Set A.R. Sensitization Stimulus Timing

Offset	# Char	Field Name	Field Definition	
0	1	Start of record	"|"	
1	3	Record type	075	
4	1	Request code	0 = Send 1 = Query for Stimulus timing selection	
5	1	Auto Timing	0 = Manual Timing 1 = Auto Timing	
6	1	Parameter type	0 = ON time 1 = OFF time 2 = Quantity	**See chart of valid selections below**
7	5	Parameter value	XXXXX	
12	1	Carriage return	"CR"	
13	1	Line feed	"LF"	

Timebase	On Time			Off Time			Quantity		
	Min	Max	Incr	Min	Max	Incr	Min	Max	Incr
1500	125	1250	125	0	1125	125	1	10	1
3000	125	2625	125	0	2500	125	1	10	1
4500	250	4000	250	0	3750	250	1	10	1
6000	250	5250	250	0	5000	250	1	10	1
7500	500	6500	500	0	6000	500	1	10	1
9000	500	8000	500	0	7500	500	1	10	1
10500	500	9000	500	0	8500	500	1	10	1
12000	500	10500	500	0	10000	500	1	10	1

NOTE

The sum of the On-time and Off-Time cannot be greater than 90% of the timebase and the ON-time cannot be 0.

8.9.3 Set A.R. Sensitization Auto Zero

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	076
4	1	Request code	0 = Send 1 = Query for Auto Zero selection
5	1	Auto Zero	0 = Automatic 1 = Manual
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.9.4 Set A.R. Sensitization ml Scale

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	077
4	1	Request code	0 = Send 1 = Query for ml Scale selection
5	1	ml Scale	0 = +.04 to -.16 1 = +.08 to -.32 2 = +.12 to -.48 3 = +.16 to -.64 4 = +.20 to -.80 5 = -.04 to +.16 6 = -.08 to +.32 7 = -.12 to +.48 8 = -.16 to +.64 9 = -.20 to +.80
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.9.5 A.R. Sensitization Ear Toggle

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	078
4	1	Selection code	0 = Send 1 = Query for ear selection
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.9.6 Set A.R. Sensitization Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	079
4	1	Request code	0 = Send 1 = Query for Admittance value
5	1	Admittance	0 = Y 1 = B 2 = G
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.9.7 Set A.R. Sensitization Timebase

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	080
4	1	Request code	0 = Send 1 = Query for Timebase selection
5	1	Timebase	0 = 1.5 sec 1 = 3.0 sec 2 = 4.5 sec 3 = 6.0 sec 4 = 7.5 sec 5 = 9.0 sec 6 = 10.5 sec 7 = 12.0 sec
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.9.8 Set A.R. Sensitization Step size

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	081
4	1	Request code	0 = Send 1 = Query for Step Size selection
5	1	step size	0 = 1 dB 1 = 2 dB 2 = 5 dB
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.9.9 Set A.R. Sensitization Facilitator

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	082
4	1	Request code	0 = Send 1 = Query for Facilitator selection
5	2	Stimulus	00 = 500 Hz 01 = 1000 Hz 02 = 2000 Hz 03 = 4000 Hz 04 = Broad Band Noise 05 = External 06 = 6000 Hz 07 = Non-Acoustic
7	3	Intensity	XXX dBHL (035 – XXX depending of Stimulus)
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

8.9.10 Set A.R. Sensitization Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	083
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.9.11 Set A.R. Sensitization Stimulus

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	084
4	1	Request code	0 = Send 1 = Query for Stimulus selection
5	2	Stimulus	00 = 500 Hz 01 = 1000 Hz 02 = 2000 Hz 03 = 4000 Hz 04 = Broad Band Noise 05 = External 06 = Non Acoustic

			07 = 6000 Hz
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.9.12 Set A.R. Sensitization Intensity

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	085
4	1	Request code	0 = Send 1 = Query for Intensity selection
5	3	Intensity	XXX dBHL (035 – XXX depending of Stimulus)
8	1	Carriage return	"CR"

8.10 Multiple Hz #1 Individual Softkey Commands

8.10.1 Set Multiple Hz #1 Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	086
4	1	Request code	0 = Send 1 = Query for Pressure Range selection
5	1	Pressure Range	0 = Normal 1 = Wide
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.10.2 Set Multiple Hz #1 Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	087
4	1	Request code	0 = Send 1 = Query for Pressure Rate selection
5	1	Pressure Rate	0 = 12.5 daPa/s 1 = 50 daPa/s 2 = 200 daPa/s
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.10.3 Set Multiple Hz #1 Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	088
4	1	Request code	0 = Send 1 = Query for Start Pressure selection
5	1	Start Pressure	0 = -600 daPa 1 = -400 daPa 2 = -200 daPa 3 = +200 daPa 4 = +400 daPa 5 = -500 daPa 6 = -300 daPa 7 = 0 daPa 8 = +300 daPa
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.10.4 Set Multiple Hz #1 Delta Plot

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	089
4	1	Request code	0 = Send 1 = Query for Admittance value
5	1	Admittance	0 = Y 1 = B 2 = G
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.10.5 Multiple Hz #1 Ear Toggle

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	090
4	1	Selection code	0 = Send 1 = Query for ear selection
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.10.6 Set Multiple Hz #1 Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	091
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right 2 = Set Peak
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.10.7 Multiple Hz #1 Continue

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	092
4	1	Request code	0 = Send
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.11 Multiple Hz #2 Individual Softkey Commands

8.11.1 Set Multiple Hz #2 Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	093
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right 2 = Set Hz
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.11.2 Multiple Hz #2 Continue

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	094
4	1	Request code	0 = Send
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.12 Multiple Hz #3 Individual Softkey Commands

8.12.1 Set Multiple Hz #3 Probe Hz

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	095
4	1	Request code	0 = Send 1 = Query for Admittance value
5	4	Probe Hz	XXXX (250 Hz to 2000 Hz in multiples of 50)
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.12.2 Set Multiple Hz #3 Cursor

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	096
4	1	Request code	0 = Send 1 = get cursor value
5	1	Cursor	0 = Move Cursor Left 1 = Move Cursor Right 2 = Set Peak
6	3	Number of dots	XXX 0 to 200 (only if cursor = 1 or 2) 0 = Position to Y axis + 1 dot
9	1	Carriage return	"CR"
10	1	Line feed	"LF"

8.12.3 Multiple Hz #3 Continue

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	097
4	1	Request code	0 = Send
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.12.4 Set Multiple Hz #3 Admittance

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	098
4	1	Request code	0 = Send 1 = Query for Admittance value
5	1	Admittance	0 = Y 1 = B 2 = G 3 = BG
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.12.5 Set Multiple Hz #3 Pressure Range

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	099
4	1	Request code	0 = Send 1 = Query for Pressure Range selection
5	1	Pressure Range	0 = Normal 1 = Wide
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.12.6 Set Multiple Hz #3 Pressure Rate

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	100
4	1	Request code	0 = Send 1 = Query for Pressure Rate selection
5	1	Pressure Rate	0 = 12.5 daPa/s 1 = 50 daPa/s 2 = 200 daPa/s
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.12.7 Set Multiple Hz #3 Start Pressure

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	101
4	1	Request code	0 = Send 1 = Query for Start Pressure selection
5	1	Start Pressure	0 = -600 daPa 1 = -400 daPa 2 = -200 daPa 3 = +200 daPa 4 = +400 daPa 5 = -500 daPa 6 = -300 daPa 7 = 0 daPa 8 = +300 daPa
6	1	Carriage return	"CR"
7	1	Line feed	"LF"

8.13 Keyboard Entry Records

8.13.1 Patient Name

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	102
4	1	Request code	0 = Send 1 = Query for Patient Name
5	45	Patient Name	Any valid keys including numbers, letters and the special characters of period, comma, hyphen, and apostrophe. There will also be certain foreign characters that are valid depending on the keyboard language that is selected under instrument options.
50	1	Carriage return	"CR"
51	1	Line feed	"LF"

8.13.2 Patient ID

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	103
4	1	Request code	0 = Send 1 = Query for Patient ID
5	45	Patient ID	Any valid keys including numbers, letters and the special characters of period, comma, hyphen, and apostrophe. There will also be certain foreign characters that are valid depending on the keyboard language that is selected under instrument options.
50	1	Carriage return	"CR"
51	1	Line feed	"LF"

8.13.3 Tester Name

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	104
4	1	Request code	0 = Send 1 = Query for Tester Name
5	45	Tester Name	Any valid keys including numbers, letters and the special characters of period, comma, hyphen, and apostrophe. There will also be certain foreign characters that are valid depending on the keyboard language that is selected under instrument options.
50	1	Carriage return	"CR"
51	1	Line feed	"LF"

8.13.4 Facility Name

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	105
4	1	Request code	0 = Send 1 = Query for Facility Name
5	45	Facility Name	Any valid keys including numbers, letters and the special characters of period, comma, hyphen, and apostrophe. There will also be certain foreign characters that are valid depending on the keyboard language that is selected under instrument options.
50	1	Carriage return	"CR"
51	1	Line feed	"LF"

8.14 Print/Clear Handling

8.14.1 Print Test

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	106
4	1	Request code	0 = Send
5	2	Test	00 = Print All tests 01-26 = Print test selected
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.14.2 Clear Test

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	107
4	1	Request code	0 = Send
5	2	Test	00 = Clear All tests 01-26 = Print test selected
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.15 Instrument Options

8.15.1 Set Print Format Command

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	108
4	1	Request code	0 = Send 1 = Query for Print Format Settings
5	1	Print Format Selections	0 = Tymp 1 = Reflex Threshold 2 = Reflex Decay 3 = ETF Intact 4 = ETF Perforated 5 = ARLT 6 = A.R. Sensi. 7 = Multiple Hz
6	1	Print Format Settings	0 = Graphics 1 = Tabular
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.15.2 Set External Printer Settings

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	109
4	1	Request code	0 = Send 1 = Query for Print Format Settings
5	1	Print Format Settings	0 = Left Column Setting 1 = Print Type
6	1	External Printer Setting	if Print Format Settings = 0 (Left Column Setting) 0 = Left Ear 1 = Right Ear if Print Format Settings = 1 (Print type) 0 = Color 1 = Black & White
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.15.3 Set Data Transfer

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	110
4	1	Request code	0 = Send 1 = Query for Data Transfer Settings

5	1	Transfer Data Selections	0 = Tymp 1 = Reflex Threshold 2 = Reflex Decay 3 = ETF Intact 4 = ETF Perforated 5 = ARLT 6 = A.R. Sensi 7 = Multiple Hz 8 = Clear Test
6	1	Transfer Data Settings	if Print format selection = 00 – 07 (test modes) 0 = Summary Data 1 = Summary + Graphics if Print format selection = 08 (External Printer) 0 = Manual 1 = Auto
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.15.4 Set Language

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	111
4	1	Request code	0 = Send 1 = Query for Language Settings
5	1	Language Settings	0 = LCD & Printer 1 = Keyboard
6	1	Language	0 = English 1 = French 2 = German 3 = Spanish 4 = Italian
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.15.5 Set Test Sequence Setting

8.15.5.1 Set Test Sequence Setting Reflex Threshold

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	112
4	1	Request code	0 = Send 1 = Query for Test Sequence Settings
5	1	Reflex Threshold Switch	0 = ON 1 = OFF
6	1	500 Hz	0 = YES 1 = NO

7	1	1000 Hz	0 = YES 1 = NO
8	1	2000 Hz	0 = YES 1 = NO
9	1	4000 Hz	0 = YES 1 = NO
10	1	LB Noise	0 = YES 1 = NO
11	1	HB Noise	0 = YES 1 = NO
12	1	BB Noise	0 = YES 1 = NO
13	1	Stimulus Ear	0 = IPSI 1 = CONTRA 2 = IPSI/CONTRA
14	1	Carriage return	"CR"
15	1	Line feed	"LF"

8.15.5.2 Set Test Sequence Setting Reflex Decay

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	113
4	1	Request code	0 = Send 1 = Query for Test Sequence Settings
5	1	Reflex Decay Switch	0 = ON 1 = OFF
6	1	500 Hz	0 = YES 1 = NO
7	1	1000 Hz	0 = YES 1 = NO
8	1	2000 Hz	0 = YES 1 = NO
9	1	4000 Hz	0 = YES 1 = NO
10	1	IPSI	0 = YES 1 = NO
11	1	CONTRA	0 = YES 1 = NO
12	1	Carriage return	"CR"
13	1	Line feed	"LF"

8.15.6 Date/Time Settings

8.15.6.1 Date/Time Formats

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	115
4	1	Request code	0 = Send 1 = Query for Date and Time Formats
5	1	Date Format	0 = MM/DD/YYYY 1 = DD/MM/ YYYY 2 = YYYY/MM/DD
6	1	Time Format	0 = 12 Hour 1 = 24 Hour
7	1	Carriage return	"CR"
8	1	Line feed	"LF"

8.15.6.2 Set Date Command

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	116
4	1	Request code	0 = Send 1 = Query for Date
5	1	Parameter Type	0 = Month 1 = Day 2 = Year
6	4	Parameter Value	XXXX
10	1	Carriage return	"CR"
11	1	Line feed	"LF"

8.15.6.3 Set Time Command

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	117
4	1	Request code	0 = Send 1 = Query for Time
5	1	Parameter Type	0 = Hour 1 = Minute
6	2	Parameter Value	XX
8	1	Carriage return	"CR"
9	1	Line feed	"LF"

8.16 Remote Function Records

8.16.1 Transmit Current XY Data Request Command

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	118
4	1	Request code	0 = Send
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.16.2 Transmit Test Data Request Command

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	119
4	1	Request code	0 = Send
5	2	Test number	XX 00 = Transmit all test 01 to 26 = Transmit test # selected
7	1	Record format	0 = Summary record 1 = Summary & Graphic record
8	1	Carriage return	"CR"
9	1	Line feed	"LF"

8.17 ACK/NAK Records

8.17.1 Record Received OK Acknowledgement - ACK

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	120
4	1	Request code	0 = Send
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

8.17.2 Record Received Incorrectly Acknowledgement - NAK

Offset	# Char	Field Name	Field Definition
0	1	Start of record	"|"
1	3	Record type	121
4	1	Request code	0 = Send
5	1	Carriage return	"CR"
6	1	Line feed	"LF"

9 Error Record Formats

9.1 Error Record Definitions

Error Code	Error Sub code	Error Description
001	000	Invalid "CRLF" record termination. The record received was not terminated by the valid ASCII character sequences (CR then LF) in the proper character positions
002	000	Record is invalid for current state. The command specified cannot be processed because it is not valid for the state of the system which is defined by the operating state (RUN, HOLD, STOP or MANUAL), whether the test is stopped, or in hold, or has been started and measurements are being made.
003	000	Record is invalid for current test mode. The command specified cannot be processed because it is not valid for the test selected (Tymp Diagnostic, Reflex Threshold, etc.).
004	000	Record is invalid for current state or test mode. The command specified cannot be processed because it is not valid for the state of the system which is defined by the operating state (RUN, HOLD, STOP or MANUAL), or the command specified cannot be processed because it is not valid for the test selected (Tymp Diagnostic, Reflex Threshold, etc.).
005	000	Invalid character for Request Code. This should be a '0' for sending a remote record and a '1' for querying a value.
006	000	Non numeric character in a numeric field. Example: The ASCII character "," in the ON time field of a Set Timing Parameter command to set the ARLT ON time to 1,000 msec, :1201 ,000CRLF.
007	000	Invalid record type. The record type specified in a record is not one of the defined record types. Example: Record type 53 would be invalid since it is not defined.
008	000	Insufficient number of pages left in the page memory to perform the requested command. Example: Selecting a Multiple Frequency test when currently on test #25. Since a Multiple Frequency test requires a minimum of 3 tests this command invalid.
010	Record Type	Invalid parameter action for specific test. Some tests do don have are not able to change parameters therefore return this error.
011	Record Type	Invalid query for specific test. Some tests do don have query results and therefore return this error.

016	000	Received character error - Framing error. The character received by the GSI TympStar did not have the proper number of Stop bits. Could be caused by a transmission error or a mismatch between the Stop bit selections between the GSI TympStar and the Remote Device.
017	000	Received character error - Overrun error. One or more characters transmitted to the GSI TympStar were lost due to insufficient time between characters to allow the GSI TympStar to process one character before another one is sent.
018	000	Received character error - Parity error. The parity of a character received by the GSI TympStar did not match the parity bit in the character. Could be caused by a transmission error or a mismatch in the parity selections between the GSI TympStar and the Remote Device.
019	000	Received character error - Break detect. A Break condition is when the Transmit Data line, TXD Pin 2, is in the "space" (low) state for greater than one character time.
020	000	An invalid Minus sign is present in a record field where it should not exist.
101	see 10.2.1	A Remote invalid key press occurred. The validation performed on single keystroke command is the same as for the corresponding front panel hard or soft key. The error subcode indicates the error or status message, which would flash on the screen if the corresponding hard or soft key had been operated.
102	Test: see 10.2.2	Integer selection for Probe Hz was not a valid selection. For example: in Tymp Diagnostic, a '4' is selected when only '0', '1', and '2' are valid choices. The error subcode indicates the current test where the error is occurring.
103	Test: see 10.2.2	Integer selection for Admittance is not a valid selection. Integer may not represent an admittance value or the admittance value may not be valid for this test. The error subcode indicates the current test where the error is occurring.
104	Test: see 10.2.2	Integer selection for Pressure Range is invalid. An integer other than a '0' or a '1' was entered. The error subcode indicates the current test where the error is occurring.
105	Test: see 10.2.2	Integer selection for Pressure Rate is not a valid selection. Integer may not represent a pressure rate value or the pressure rate value may not be valid for this test. The error subcode indicates the current test where the error is occurring.
106	Test: see 10.2.2	Integer selection for Start Pressure is not a valid selection. For example: in an ETF Intact test, a '9' is selected as the integer for start pressure when only '0' to '8'are valid choices. The error subcode indicates the current test where the error is occurring.

107	Test: see 10.2.2	Integer selection for Baseline is invalid. An integer other than a '0' or a '1' was entered. The error subcode indicates the current test where the error is occurring.
108	Test: see 10.2.2	Integer selection for Gradient was not a valid option. For example: in Tymp Diagnostic, a '6' is selected when only '0','1', and '2' are valid choices. The error subcode indicates the current test where the error is occurring.
109	Test: see 10.2.2	Integer selection for Cursor is invalid, the integer chosen does not represent the moving of the cursor, turning it off or setting a peak. The error subcode indicates the current test where the error is occurring.
110	001	Integer selection for Auto Start is invalid. An integer other than a '0' or a '1' was entered.. '0' and '1' represent ON and OFF. The error subcode indicates the current test where the error is occurring.
111	001	Integer selection for Reflex Type is invalid. The error subcode indicates the current test where the error is occurring.
112	001	Integer selection for Stimulus Hz is invalid. Either an invalid choice was made or too many stimuli were turned on. Only one stimulus can be turned on for a reflex type of IPSI/CONTRA while two stimuli can be on with a reflex type of IPSI or CONTRA. The error subcode indicates the current test where the error is occurring.
113	Test: see 10.2.2	Invalid Integer selection for Stimulus EAR. Integer may not represent a Stimulus Ear value or the Stimulus Ear value may not be valid for this test. The error subcode indicates the current test where the error is occurring.
114	002	Invalid selection for mark threshold. This could be either that the trace they are trying to mark does not exist or that the integer representing the type of mark is invalid. The error subcode indicates the current test where the error is occurring.
115	002	Invalid selection of the Threshold Seek parameter that needs to be changed. Only the integers 0-4 are valid here. The error subcode indicates the current test where the error is occurring.
116	Test: see 10.2.2	Integer selection for Auto Zero is invalid. An integer other than a '0' or a '1' was entered. The error subcode indicates the current test where the error is occurring.
117	Test: see 10.2.2	Invalid selection of the stimulus timing parameter that is desired to be changed. Only the integers 0-4 are valid here. The error subcode indicates the current test where the error is occurring.
118	Test: see 10.2.2	Integer for selection of timebase is incorrect. The integer selected does not properly represent a valid timebase. The error subcode indicates the current test where the error is occurring.

119	Test: see 10.2.2	Integer selection for Step size was not a valid option. For example: in Reflex Decay, a '7' is selected when only '0','1', and '2' are valid Step size choices. The error subcode indicates the current test where the error is occurring.
120	Test: see 10.2.2	Integer for selection of ml Scale is incorrect. The integer selected does not properly represent a valid ml Scale. The error subcode indicates the current test where the error is occurring.
121	Test: see 10.2.2	Integer selection for the Stimulus is not a valid selection. Integer may not represent a valid stimulus or the stimulus selected may not be valid for this test. The error subcode indicates the current test where the error is occurring.
122	005	Integer selection for Time (sec) is not a valid selection. For example: if a '9' is selected as the integer for Time (sec) when only '0' to '3'are valid choices, this error code will be returned. The error subcode indicates the current test where the error is occurring.
123	008	Integer selection for the Stimulus part of the Facilitator is not a valid selection. The number entered may not represent a valid stimulus or the stimulus selected may not be valid for this test. The error subcode indicates the current test where the error is occurring.
124	Test: see 10.2.2	The value of the numeric field for the cursor is out of range. This means that the value entered needs to be changed to a value from 1-200. The error subcode indicates the current test where the error is occurring.
125	Parameter type:	The value of a numeric field for the Stimulus timing is out of range or not in the specified increment. The table time below the input record type shows the valid times and Increments. The error subcode indicates the parameter type that is out of range or incremented incorrectly: 000 = ON time 001 = OFF time 002 = Quantity
126	000	The value of a numeric field for the click rate is out of range or not in the specified increment. This means that the value is not in the range from 10-300 or is not a multiple of 10.
127	Intensity	The value of the numeric field for the Intensity Timing is out of range. The error subcode indicates the Intensity entered that is out of range.
128	Max Pressure	The value of the numeric field for the Pressure Max is out of range or not in the specified increment. Example: Specifying an ETF-Perforated TM test maximum pressure of 111 daPa. The specified increment is 50 daPa so valid values would be 100 or 150 daPa. The error subcode indicates the maximum pressure entered that is out of range.
129	000	The value of a numeric field for the Stimulus On-Time out of range or not in the specified increment. The table below the input record type shows the valid times and increments.
130	000	The value of a numeric field for the ARLT Average is out of range. This implies that the value is not in the range from 2-50.

131	Intensity	The value of the numeric field for the Intensity part of the Facilitator is out of range. The error subcode indicates the Intensity entered that is out of range.
132	000	The value of a numeric field for the Multiple Hz #3 Probe Hz is out of range or not in the specified increment. This means that the value is not in the range from 250-2000 or is not a multiple of 50.
133	Field	Invalid character entered for one of the keyboard entry fields. These fields are limited to all numbers, letters, as well as special characters including the hyphen, apostrophe, period and comma. Also, the appropriate foreign characters will be valid with the language selected under keyboard language in instrument options. The error subcode indicates the field for which an invalid character is being entered: 000 = Patient Name 001 = Patient ID 002 = Tester Name 003 = Facility Name
134	Action	Invalid test data request. Data was requested to be printed, transferred or cleared for a test which is greater than 26. The error subcode indicates the action requested for the test greater than 26: 000 = Print Test 001 = Clear Test 002 = Transfer Test
135	Action	Invalid test data request. Data was requested to be printed, transferred or cleared for a test which has not yet been performed. Example: Current test is #3 but data was requested for test #5.The error subcode indicates the action requested for the invalid test: 000 = Print Test 001 = Clear Test 002 = Transfer Test
136	Menu Item	Invalid selection in Instrument Options. An integer selection for setting Instrument options was not valid. The error subcode indicates the instrument options menu item causing the error. 000 = Invalid Menu Item 001 = Print Format 002 = Data Transfer 003 = Language 004 = Test Sequence 005 = Remote Settings 006 = Date/Time Formats 007 =Set Date 008 = Set Time
137	000	Invalid Current XY Data request. This command is invalid in Multiple Frequency Screen #2.
138	000	Invalid selection with Program Mode Records.
139	000	Error entering Altitude Calibration using the remote system.
140	000	Error using record that is not available in Version 1.
141	000	Error using record for single key press. The keycode entered must be between 1 and 26 to represent the hardkeys or softkeys.

9.2 Error Subcodes

9.2.1 Error Record 101 Subcode Definitions

Error Sub code	Error / Status Message and Description
164	ALERT INVALID SELECTION A General error message indicating that the command is invalid for the current instrument state. This message is used for invalid softkeys and various other common improper selections.
178	LEAK TEST ABORTED Leak occurred while a test other than Tymp Screening with Auto Start selected was in progress. The STOP mode is automatically entered.
209	VALID INTENSITY LIMIT REACHED Indicates that the minimum or maximum Intensity limit was reached for an Intensity Up/Down or Set Activator / Facilitator command.
214	OCCLUSION REMOVE PROBE Occlusion was detected during a Tymp Screening test with Auto Start selected. The STOP mode is automatically entered.
216	ALERT INVALID SELECTION—PRINTER ACTIVE Page, Print or Clear command sent while a printout was in progress.
217	ALERT INVALID SELECTION—IN PROGRAM MODE Clear, Page, Erase, Manual or Hold command sent while in the Program Mode.
218	ALERT INVALID SELECTION—AUTO START SELECTED START RIGHT or START LEFT command sent while in Tymp Screening Test with Auto Start selected.
219	ALERT INVALID SELECTION—PRESSURIZING TO START PRESSURE An invalid command was sent while the system is pressurizing before starting a test.
259	ALERT INVALID SELECTION—TEST IN PROGRESS An invalid command was sent while the system is running a test. This will occur on most key presses other than stop when any data is being plotted.
260	ALERT INVALID SELECTION—MUST MAKE SOFTKEY SELECTION An invalid command when the start keys are pushed from the Multiple Hz stop NEXT SERIES menu.
261	ALERT INVALID SELECTION—NO TEST DATA STORED Page, Print or Clear command sent when there is not any test data stored in page memory.
270	ALERT PAGE MEMORY FULL—MUST CLEAR TEST DATA TO RESUME Command is invalid due to insufficient page memory available.
271	ALERT INVALID SELECTION——NO TEST DATA DISPLAYED Data Transfer or Erase command sent when there is not any test data displayed on the screen.
276	ALERT INVALID SELECTION—STORING TEST DATA Command is invalid while storing the test data when the HOLD or STOP mode is being entered.
277	ALERT TEST IN PROGRESS— LEFT EAR STILL BEING TESTED The Ear selection switch on the Probe box was changed from the Left position to the Right position while a test was in progress.
278	ALERT TEST IN PROGRESS—RIGHT EAR STILL BEING TESTED The Ear selection switch on the Probe box was changed from the Right position to the Left position while a test was in progress.
279	TEST COMPLETE REMOVE PROBE A Tymp Screening test with Auto Start selected has completed successfully.

280 PRESSURE MAXIMUM REACHED
This is a valid status message which is sent when the maximum pressure selected in an ETF perforated test is reached.

281 EUSTACHIAN TUBE OPENED
This is a valid status message which is sent when the Eustacian tube is opened during an ETF perforated test

283 MANUAL MODE PRESSURE MAXIMUM REACHED
This is a valid status message which is sent when the maximum pressure selected in a Manual ETF perforated test is reached.

284 MANUAL MODE EUSTACHIAN TUBE OPENED
This is a valid status message which is sent when the Eustacian tube is opened during a Manual ETF perforated test

288 PRESSURIZING TO START PRESSURE
This is a status message displayed when the system pressurizes in a Tymp-type test to the selected start pressure.

295 EXCEEDED TIMEBASE OFF TIME MODIFIED
The selection of a new ON time in a Set Timing Parameter command has caused the current OFF time to be decreased so that the total ON and OFF time fits on the current timebase.

310 EXCEEDED TIMEBASE ON/OFF TIMES MODIFIED
The selection of a new timebase in a Set Timing Parameter command has caused the ON and OFF times to be decreased so that the total ON and OFF time fits on the new timebase.

318 NOTE SITE ALTITUDE DEFAULTED TO 0—REENTER IF NECESSARY
The site altitude was defaulted to 0 feet because it could not be read properly from the memory.

333 NOTE STIMULUS NOT AVAILABLE—CONTACT SERVICE
A Stimulus Up/Down or Set Activator/Facilitator Stimulus command is invalid due to a problem with reading the stimulus SPL calibration data from memory.

335 NOTE GSI DEFAULTS USED—REPROGRAM
Indicates that there was a problem with reading the Program Mode User test parameters from memory when selecting a test so the GSI default test parameters were used.

357 NOTE TEST NOT AVAILABLE—CONTACT SERVICE
Indicates that, when selecting a Reflex type test, the information stored in memory which defines if the stimuli were calibrated in the User Custom SPL mode could not be read properly.

358 NOTE REFLEX DECAY NOT AVAILABLE—CONTACT SERVICE
Indicates that, when selecting the Special hard key, the information stored in memory which defines if the stimuli were calibrated in the User Custom SPL mode could not be read properly. The unit will default to a Multiple Frequency test instead.

374 ALERT PRINTER ERROR—CHECK PAPER OR RELEASE LEVER
Indicates that the printer is unable to print due to either being out of paper or the release lever is in the wrong position.

433 ALERT INVALID SELECTION—PROBE TONE NOT SELECTED
Command was invalid in the Altitude Calibration mode due to not having selected a probe tone.

437 ALERT ALTITUDE LIMIT REACHED
The minimum or maximum altitude selection limit was reached for a Step Altitude Up/Down command in the Altitude Calibration mode.

439 ALERT ACTIVATOR STIMULUS DEFAULTED
Indicates that the activator stimulus was defaulted due to a Set Facilitator Stimulus command during an ARST test.

445 ALERT INVALID SELECTION—NO DATA STORED ON CURRENT LINE
Invalid selection when there is no data stored on the second line of a reflex-type test. The alert I sent so that the user cannot delete data fro the top plot while on the second plot.

446 ALERT INVALID SELECTION—PRESS EXIT
Invalid selection when the present bar is pushed from threshold seek and stimulus timing sub menus. The changes have not been committed till these menus are exited so the must be for a test to run.

454 ALERT HIGH INTENSITY SELECTED
Indicates that an Intensity level of greater than 100 db was selected via an Intensity Up/Down or Set Activator/Facilitator command.

456 NOTE CAN NOT START TEST-DO ALTITUDE CAL-CONTACT SERVICE Indicates that a test could not be started due to an error in reading the altitude information stored in memory when the unit was turned on.

459 ALERT MUST SELECT A TEST TO PROGRAM
The Store Program Mode data is invalid in the Tymp Program Mode until a test type to program is selected.

460 ALERT PROBE MUST BE IN CAVITY BEFORE DATA TRANSFER
The Data Transfer command in the Altitude Calibration mode is invalid until the probe is placed in a cavity.

463 ALERT INVALID SELECTION—PRESSURIZING TO MAXIMUM PRESSURE
Command is invalid in ETF-Perforated test while it is pressurizing to the selected maximum pressure.

481 ALERT PNEUMATIC SYSTEM ERROR-IF ERROR REPEATS CONTACT SERVICE
Indicates that a problem exists in the pneumatic system which prevents the pump from establishing the desired pressure.

494 ALERT CAN NOT CONTINUE WITH DIFFERENT COMPONENT
Indicates that in a Tymp Diagnostic test, it is invalid to change the admittance selection while in HOLD and then try to restart the tymp sweeping in the same direction. After changing the admittance it is only valid to resume sweeping in the opposite direction.

495 ALERT ONLY ONE LINE LEFT—CHOOSE A DIFFERENT COMPONENT Indicates that in a Tymp Diagnostic test, it is invalid to perform 2 tymps in the same test with B/G selected.

510 ALERT NO VALID PEAK SET
The Multiple Frequency Screen #1 Continue command is invalid unless there is a valid peak set for the tymp.

544 ALERT INVALID SELECTION WHILE CURSOR IS ACTIVE
Invalid selection when most keys are hit while the cursor is active.

545 ALERT SOFTKEY INVALID IN THIS MODE
Invalid selection because Mark threshold or cursor was selected incorrectly from page mode.

587 ALERT MUST CALIBRATE 678HZ BEFORE 1000HZ
Indicates that the Data Transfer command in the Altitude Calibration mode is invalid until after 678 Hz has been calibrated if calibration of all probe tone frequencies is required due to an altitude change.

607 OCCLUSION TEST ABORTED
Indicates that an occlusion was detected during a test (except Tymp Screening with Auto Start) in progress and that the test was stopped.

608 LEAK TEST ABORTED—REMOVE PROBE
Indicates that a leak was detected during a Tymp Screening test with Auto Start selected and that the test was stopped.

638 ALERT REMOTE MODE NOT SELECTED
Indicates that the Data Transfer command will not be able to process while not in the remote mode.

639 ALERT INVALID SELECTION. DATA TRANSFER IN PROGRESS
Indicates that the TympStar is trying to transfer data and that the key pressed is invalid during a data transfer.

640 ALERT INVALID WHILE TEST IN PROGRESS
Invalid while test is running for Tymp-type tests and while Reflex-type tests are plotting.

641 ALERT INVALID WHILE IN PRINT OR CLEAR
The Data Transfer or Transmit Test Data Request command is invalid while in the Print or Clear mode.

642 ALERT DATA TRANSFER IN PROGRESS
Indicates the status of a data transfer. This will always be displayed on the screen while the data transfer is taking place. The message will be sent remotely every time a data transfer takes place.

643 ALERT DATA TRANSFER INHIBITED - DATA TRANSFER ABORTED
Indicates that the instrument has detected tha the RTS line is in a disabled (low) state.

644 ALERT DATA TRANSFER ERROR - DATA TRANSFER ABORTED
Indicates that Data Transfer was selected but the TympStar was unable to transfer the data to a remote system and that the data transfer has been cancelled.

650 ALERT INVALID SELECTION —MUST SELECT TEST TO DISPLAY
Invalid selection since in page but no test to be displayed was selected yet.

735 LARGE TIMEBASE - ON TIME MODIFIED
Indicates the status of the on time since the on time was changed by a change in the timebase.

740 PRINT CANCEL IN PROGRESS
Indicates that the print cancel softkey was selected and that the TympStar is currently canceling the print job.

743 ALERT NO PROBE - POWER OFF ATTACH PROBE AND POWER ON
This error indicates that there was no probe found. This is usually the resul of trying to run a test with the probe off.

745 ALERT NEW PROBE - POWER OFF & POWER ON
Indicates that the TympStar has recognized a new probe and that the calibration process needs o take place before progressing.

756 THRESHOLD SEEK IN PROGRESS
Status message that threshold seek is in progress and searching for the correct trace to mark. This is only available in Reflex threshold tests.

757 ALERT NOT AVAILABLE
Indicates that a certain function of the Tympstar is not available. It may be available in later versions of the TympStar software.

760 CLEARING TEST DATA
Indicates that the clear test command has been called and that the system is in the process of clearing test(s).

762 ALERT INVALID SELECTION WHILE MARK THRESHOLD IS ACTIVE
Invalid selection when most keys are pressed while mark threshold is active.

763 ALERT INVALID SELECTION WITH NONACOUSTIC STIMULUS
Indicates that the user tried to turn on threshold seek. This is an invalid command while the Non-Acoustic stimulus is selected.

9.2.2 Error Record TEST Subcode Definitions (Errors 101-121)

Error Sub code	Error / Status Message and Description
001	TYMP DIAGNOSTIC TEST
002	TYMP SCREENING TEST
003	REFLEX THRESHOLD TEST
004	ETF INTACT TM TEST
005	ETF PERFORATED TM TEST
006	REFLEX DECAY TEST
007	ARLT TEST
008	A. R. SENSITIZATION TEST
009	MULTIPLE HZ #1 TEST
010	MULTIPLE HZ #2 TEST
011	MULTIPLE HZ #3 TEST

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